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Review of the Dinematichthyini (Teleostei: Bythitidae) of the Indo-West Pacific. Part I. *Diancistrus* and two new genera with 26 new species

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ABSTRACT

An ongoing revision of the dinematichthyine fishes (Ophidiiformes, Bythitidae, Brosmophyeinae) of the Indo-West Pacific based on ca. 5000 specimens will be published in parts. Part 1 includes 765 identified specimens in the genera *Brotulinella* (new genus with one new species), *Diancistrus* Ogilby, 1899 (with four described and 23 new species) and *Paradiancistrus* (new genus with two new species). The main distinguishing character in this group of presumably related genera is the male pseudoclasper pattern. *Brotulinella* is further characterized by the slender form and the generally higher number of preanal vertebrae (12 versus 11 in the two other genera, except for one species with 12 in *Diancistrus*). *Paradiancistrus* is unique amongst Indo-West Pacific dinematichthyine genera in having only one instead of three lower preopercular pores. *Brotulina* Fowler, 1946, *Calcarbrotula* Fowler, 1946 and *Parabrosmiolus* Machida, 1996, are regarded as junior synonyms of *Diancistrus*. The separating characters of the species are male pseudoclaspers, head squamation, head pores, otoliths, morphometric proportions, and fin ray and vertebral counts. *Diancistrus*, which has remained monotypic for more than 100 years, is here shown to be one of the most diverse genera of tropical reef fishes. The many unrecognised species have previously been confused with other genera such as *Dinematichthys* and *Ogilbia*. Pseudoclasper morphology is used to define three informal species groups in the genus *Diancistrus*.

KEYWORDS: viviparous brotulas, Indo-West Pacific, Australia, Indonesia, Micronesia, New Guinea, Philippines, Polynesia, Ryukyu Islands, coral reef fishes, *Diancistrus*, new genera, new species.

CONTENTS

INTRODUCTION

In the latest comprehensive review of ophidiiform fishes (Nielsen *et al.* 1999), the dinematichthyine fishes, a tribe within the subfamily Brosmophycinae of the viviparous family Bythitidae, were represented by 12–14 genera and ca. 25 species worldwide. For distinction from the other tribe within Brosmophycinae, the Brosmophycini, see the diagnosis to the Dinematichthyini below. After the recent review of the American Dinematichthyini (Møller *et al.* 2004a and 2005) the number now stands at 13 genera and 52 species. Following the ongoing review of the Indo-West Pacific Dinematichthyini currently under way, the number of species is likely to double.

Some species may reach 100–120 mm in length, a few even 150 mm, others not more than 25–30 mm. When newly born, dinematichthyine fishes are 10–15 mm long. They live in shallow tropical to subtropical waters, hidden in holes and crevices of coral reefs, algae beds and rocky shores. Different reefal environments, such as reef drop-offs, surge channels, lagoons or tide pools can be dominated by different groups of the Dinematichthyini. The species of the genera *Diancistrus* and *Dinematichthys* for instance are typical of the main reef bodies, are less common in lagoons and rare in tide pools or rocky shores. The geographical distribution of most dinematichthyine species is very restricted, but there are also notable exceptions of wide distribution patterns (see for instance *D. alleni* n. sp., *D. beateae* n. sp. or *D. katrineae* n. sp. and section Geographic Distribution).

Dinematichthyine species show relatively little variation in their general appearance, and their live coloration tends to be uniform, the prevailing colours being yellow, orange, red and brown. Møller *et al.* (2004a) used the apomorphic position of the copulatory organ below a covering fleshy hood in a cavity of the ventral body wall as the main diagnostic character for the bythitid tribe Dinematichthyini, thereby confirming Sedor's (1985) view. In all other viviparous bythitids (Brosmophycini and Bythitinae), the copulatory organ is an integrated part of the fleshy genital hood, with the penis present as a small, soft papilla. Pseudoclasper-like structures, if present, are indistinct papillae with or without a slight sclerification in the form of a superficial thickening of the epidermis.

Until the introduction of scuba-diving and the use of fish poison, dinematichthyine fishes were rarely caught, but with these methods the catches have exploded. Today, many museums hold several thousand specimens of dinematichthyine fishes. Considering how common they are, dinematichthyine fishes must play an important role in the ecology of reefs.

Due to the large amount of material with many new taxa we have decided to deal with the dinematichthyine fishes of the Indo-West Pacific in four volumes: the future

three parts will revise the genera *Beaglichthys, Brosmolus, Monothrix* and include several new genera, revise the genera *Dermatopsis, Dermatopsoides* and *Dipulus* and finally revise the most common genus *Dinematichthys sensu lato.*

Prior to this review, *Diancistrus* was a monotypic genus, known only from the type species *D. longifilis.* It was described in 1899 by Ogilby based on a single type specimen caught at the isolated Lord Howe Island in the Tasman Sea. Since then, it has been recorded only as secondary citations in check lists or systematic reviews. The type specimen was reviewed and refigured for the first time 100 years later by Nielsen *et al.* (1999). Specimens caught off Lord Howe Island were often identified as *D. longifilis* in various collections. A second dinematichthyine fish occurs at Lord Howe Island belonging to the genus *Dinematichthys sensu lato*, with which it was commonly confused.

MATERIAL AND METHODS

Examination of ca. 5000 specimens of Indo-West Pacific Dinematichthyini yielded 835 identified to the genera treated herein. Of these, 765 were identified to the species level whereas the remaining 70, mostly juvenile or female specimens, could only be identified to the genus level. The 765 identified specimens include a small number of specimens that are only tentatively assigned to species. Also included are specimens viewed and identified in the collections of the AMS and the USNM but not borrowed for detailed investigations. These are listed as additional specimens and are not referred to as type specimens for any of the new species. Despite the very large number of Indo-West Pacific specimens investigated, we expect that still more new species and more specimens of rare species will be found in collections or when regions now under-represented in collections are sampled for dinematichthyines. As for the latter we particularly expect more undescribed species from Indonesia, the Nicobar and Andaman Islands and the Indian subcontinent.

The material and comparative material belongs to the following institutions: AMS (Australian Museum, Sydney), ANSP (Academy of Natural Sciences, Philadelphia), ASIZP (Academia Sinica Institute of Zoology, Taipei), BPBM (Bernice P. Bishop Museum, Honolulu), CAS (California Academy of Sciences, San Francisco), LACM (Los Angeles County Museum), MCZ (Museum of Comparative Zoology, Harvard Museum), MNHN (Museum Nationale d'Histoire Naturelle, Paris) NHM (= BMNH; The Natural History Museum, London), NMNZ (Museum of New Zealand Te Papa Tongarewa, Wellington), NSMT (National Science Museum, Tokyo), NMV (National Museum of Victoria, Melbourne), NTM (Museum and Art Gallery of the Northern Territory, Darwin), QM (Queensland Museum, Brisbane), ROM (Royal Ontario Museum, Toronto), SAIAB (South African Institute for Aquatic Biodiversity, formerly RUSI (JLB Smith Institute of Ichthyology), Grahamstown), SAM (South African Museum, Cape Town), SIO (Scripps Institute of Oceanography, La Jolla), SMNS (Staatliches Museum für Naturkunde, Stuttgart), TAU (Tel Aviv University), UMMZ (University of Michigan, Museum of Zoology), USNM (United States National Museum, Washington), WAM (Western Australian Museum, Perth), YCM (Yokosuka City Museum), ZMUC (Zoological Museum, University of Copenhagen).

Morphometric characters are given as percent of standard length (SL) throughout. In the descriptions holotype values are given first, followed by the range in paratypes in brackets. Size of eye is measured as horizontal diameter of pigmented eyeball. Meristic counts were made from radiographs, except for pectoral fin rays, gill rakers, teeth and scale rows. Abbreviations used in meristic counts are: D/V = anterior dorsal fin ray above vertebra number; D/A = anterior anal fin ray below dorsal fin ray number; V/A = anterior anal fin ray below vertebrae number.

Otoliths were removed through the gill cavity by making a small cut above the gills on the right side. Size of body scales was measured on holotypes at mid-body above anal fin origin.

Pseudoclaspers were observed by bending forward the fleshy hood covering the copulatory organ and thereafter by bending outwards the pseudoclaspers or spreading them and fixing them with a thin needle. It was not necessary to dissect pseudoclaspers for morphological analysis. In drawings, the pseudoclaspers and penis are shaded; other parts, such as the fleshy hood, isthmus or outline of the copulatory cavity are simple line drawings.

In order to avoid excessive redundancy, the descriptions of the individual species of the genus *Diancistrus* concentrate on those characters depicting significant variance or difference from the general character states found within this genus. For further correlation of individual species, reference is made to Table 2 (pseudoclasper patterns, scales on operculum, eye size, total number of vertebrae), Table 3 (dorsal fin ray counts) and Table 4 (selected morphometric measurements).

The ecology of most of the species is poorly known. From station data we have gathered information about habitat and depth range, but we have no, or very little, data about behaviour, live coloration and feeding. A number of females were examined for reproductive data, e.g., number and size of embryos.

The distribution maps were created using Microsoft Encarta 2001 digital world atlas.

DEFINITION OF CHARACTERS

Male pseudoclaspers are the most important characters for separating the species. Juveniles and females can be difficult to identify for some species, even though the distribution pattern deduced from male occurrences in

many instances will allow at least a tentative specific assignment of females. Due to the somewhat inconsistent and confusing nomenclature and terminology of characters in the dinematichthyine literature, the more important characters have been re-defined in Moller *et al.* (2004a) and are here briefly summarized as follows:

Head pore system (Fig. 1). The following pore rows are recognized: supraorbital row holds 3–4 pores; the posteriormost was previously termed the first lateral line pore (e.g. Machida 1994; Cohen and McCosker 1998). It is located above the opercular spine at the upper termination of the gill opening and is part of the supraorbital row. The infraorbital row holds 3 anterior and 2–3 posterior pores. The mandibular row holds 3 anterior and 3 posterior pores. The preopercular row generally holds 3 lower and 1 upper pore, but the number is reduced in some species and genera. The first and second lower preopercular pores are often placed in a common pore-like cavity. The latter two rows form a continuous system and are often referred to in literature as the preoperculo-mandibular pore row.

Male copulatory organs (Fig. 2) are covered anteriorly by a thick fleshy genital hood that originates from the posterior margin of the anus. The organs consist of a penis flanked by one or two pairs of pseudoclaspers (three solely in *Ogilbichthys* Moller *et al.*, 2004a, a genus from American waters) on each side, and a sometimes indistinct, accessory organ at the base of the penis. The pseudoclaspers may contain hardened, sclerified bodies that keep them in an upright position. These are

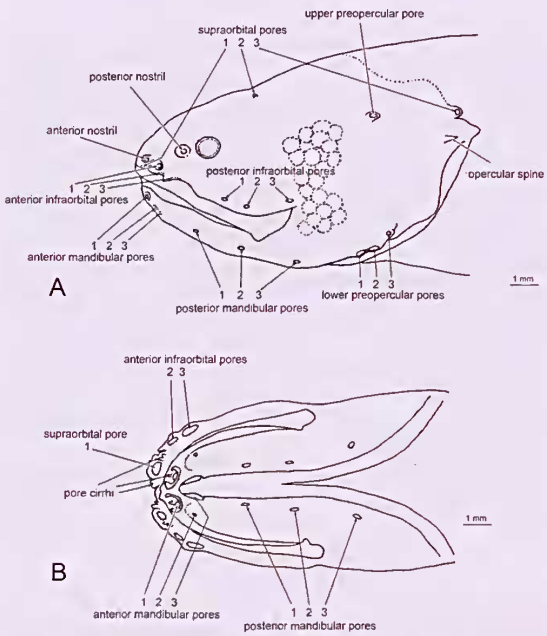

Fig. 1. Head pore system terminology. Open pores shown as solid circles and pores hidden from lateral view as dashed circles. **A**, lateral view of head; **B**, ventral view of head.

here termed supporters. A fleshy isthmus separates the pairs of pseudoclaspers, originating from the hood and joining the base of the penis. A ligament that passes around the posterior base of the penis connects the outer pseudoclaspers (o.p) distally. The inner pseudoclasper (i.p.) is free or joined to the outer pseudoclasper and/or to the isthmus between the pseudoclaspers by a ligament. For a detailed description of the reproductive ecology and functional anatomy of the copulatory apparatus see Turner (1946) and Suarez (1975). Pseudoclaspers are best studied in preserved fish, since the hood has been found to be very stiff in freshly dead specimens.

In this paper one of the pseudoclaspers is shown usually from the left inside. Additionally, the entire copulatory apparatus is illustrated with the fleshy hood bent forward from an inclined lateral view, showing one pair of pseudoclaspers from the outside, the other from the inside. A schematic sketch of a ventral view with (or sometimes without) the hood bent forward is sometimes added, because at the first inspection of the organ this often gives valuable identification hints in the case of the genera reviewed here.

The presence of one or two pairs of pseudoclaspers is, with very few exceptions, used for definition of genera, while details of the pseudoclasper morphology are used for species definition. In fact, there are only few instances where specific differences rely exclusively on other characters. The genera treated herein all have two pairs of pseudoclaspers, with the inner pseudoclasper placed at the anterior margin of the outer pseudoclasper. The inner pseudoclasper in these three genera is mostly much smaller than the outer pseudoclasper, often joined to it and sometimes atrophied to the extent of the complete loss of a supporter.

Examination of the pseudoclaspers of more than 2000 mature male dinematichthyines has revealed that its morphology is very stable, both in terms of variability and ontogenetic changes (the latter after maturity has been reached). Within the Indo-West Pacific Dinematichthyini, limited allometric growth has been observed in few species, for instance of the genus *Diancistrus*.

Sagittal otolith (Fig. 3). Terms of the sagitta follow Schwarzhans (1993). The sagittae ('otolith' in the following) of dinematichthyine fishes show little ontogenetic and intraspecific variation in contrast to certain other ophidiiform fishes. Sexual dimorphism of otoliths has been observed in several ophidiiform fishes (Schwarzhans 1994), but is found mostly negligible in the case of the Dinematichthyini. For a comprehensive review of ophidiiform otolith morphologies see Nolf (1980) and Schwarzhans (1981). The most easily recognizable character in dinematichthyine otoliths is the status of the sulcus, i.e. divided (separated colliculi) or undivided (fused colliculi) and the form of the ventral margin of the sulcus between the two. These characters are often used as additional characters for generic diagnoses. For instance

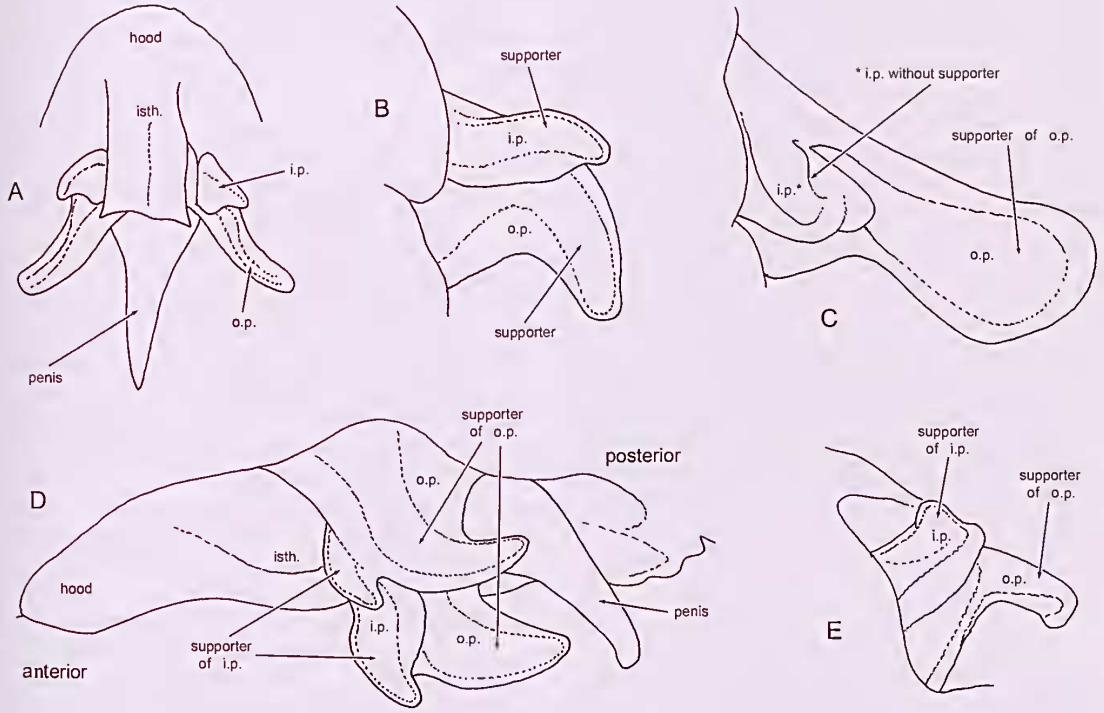

Fig. 2. Male copulatory organ terminology. **A**, ventral view of male copulatory organ (*Diancistrus karinae* n. sp.); **B–C, E**, view of left pseudoclasper from inside, **B**, *Diancistrus karinae* n. sp., **C**, *Diancistrus altidorsalis* n. sp., **E**, *Diancistrus beateae* n. sp.); **D**, inclined lateral view of male copulatory organ (*Diancistrus karinae* n. sp.).

Diancistrus can always be distinguished readily from *Dinematichthys* by the status of the colliculi (fused versus separated). However, fusion of colliculi is a very common trend in Dinematichthyini and other ophidiiform fishes and has apparently occurred in multiple parallel lineages; i.e. there are several other dinematichthyine genera not closely related to *Diancistrus* with fused colliculi. In the case of *Diancistrus* the use of otolith morphology is restricted to selected cases for differentiation of the many species.

Selected additional characters (general morphology) of important diagnostical value are:

Head squamation usually requires removal of mucus, which often covers the head. Only a few species of *Dinematichthys s.l.* from the Indo-West Pacific show complete squamation of the head. In most other Dinematichthyini head squamation is restricted to the cheek and the operculum above (and sometimes also below) the opercular spine, or is missing entirely from the head. Such differences are used in generic as well as in species definitions. In the case of *Diancistrus* a thin skin may in addition cover those scales above and below the opercular spine. Their occurrence and number are often of important

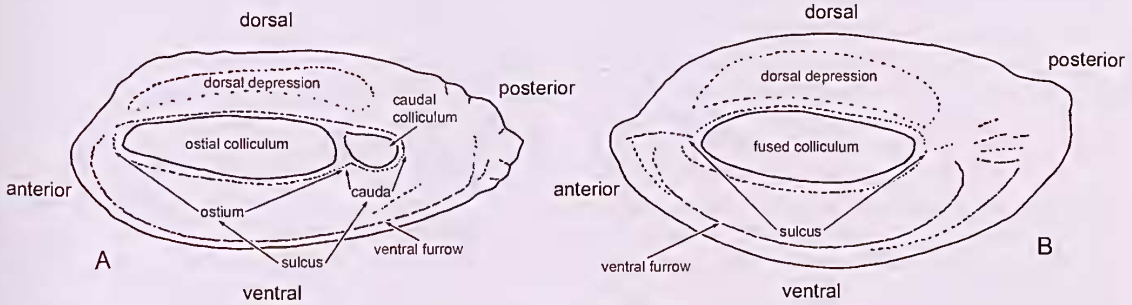

Fig. 3. Otolith (sagitta) terminology. Median view of right otolith: **A**, *Dinematichthys*; **B**, *Diancistrus*.

diagnostic value in this genus. When the skin is removed and the scales are uncovered, they come loose and can then easily fall off, although scale pockets will give an indication that scales were there originally. Therefore, whenever possible, one side of a fish investigated for head squamation was left untouched.

The anterior nostril is normally placed close to the tip of the snout in bythitids, but in *Dinematichthys s.l.* and a few related, yet undescribed Indo-West Pacific genera it is positioned mid-way between snout and posterior nostril, i.e., high above the upper lip. However, in the case of *Diancistrus* the anterior nostril is often positioned intermediate between that observed in *Dinematichthys* and the remainder of the Dinematichthyini and thus causes this character here to be less reliable than usual.

Absolute body size of mature males and females is variable in the case of the genus *Diancistrus*, which contains species with mature males at a size of 30 mm SL that do not exceed 60 mm SL (for instance *D. alatus* and *D. mcgrouther*i) and others, which are only mature at sizes >55 mm SL and reach up to over 120 mm SL (*D. beateae*).

COMPARATIVE MATERIAL

Indo-West Pacific Dinematichthyini. *Beaglichthys macrophthalmus* Machida, 1993: HOLOTYPE – NTM S.10395-001-1, NON-TYPE: WAM P. 28155-019. *Brosmolus longicaudus* Machida, 1993: HOLOTYPE – NTM S.10623-001. *Dermatopsis macrodon* Ogilby, 1896: HOLOTYPE – AMS I. 3505; NON-TYPES: WAM P. 27112-005 (3 specimens). *Dermatopsis multiradiatus* McCulloch and Waite, 1918: PARATYPE – AMS I. 14614. *Dermatopsoides kasougae* (Smith, 1943): HOLOTYPE – RUSI 333, only radiograph examined; NON-TYPE – RUSI 8547. *Dermatopsoides talboti* Cohen, 1966: HOLOTYPE – RUSI 340, only radiograph examined; PARATYPES – RUSI 339, only radiograph examined; NON-TYPES –SAM 21800; SAM 21963. *Dipulus caecus* Waite, 1905: NON-TYPES – WAM P. 29884-012; WAM P. 29886-007; ZMUC P 77485-87 (3 specimens). *Dipulus norfolkanus* Machida, 1993: NON-TYPES – NMNZ 11706; NMNZ 11742; NMNZ 27162 (3 specimens); NMNZ 27166 (4 specimens). *Dinematichthys dasyrhynchus* Cohen and Hutchins, 1982: PARATYPES – AMS I. 20245-016 (3 specimens); NON-TYPES – WAM P. 27950-011 (2 specimens), WAM P. 27951-007, ZMUC P 77716-18. *Dinematichthys iluocoeteoides* Bleeker, 1855: BMNH 1862.2.28.65. *Dinematichthys indicus* Machida, 1994: PARATYPES – ROM 37813-2 (14 specimens), ROM 58269 (8 specimens). *Dinematichthys megasoma* Machida, 1994: NON-TYPES – WAM P. 30308-001 (7 specimens), WAM P. 30909-002 (9 specimens). *Dinematichthys mizolepis* Günther, 1867: HOLOTYPE – BMNH 1867.5.13.17. *Dinematichthys ryukyuensis* Aoyagi, 1954: HOLOTYPE – YCM-P 30001(1); NON-TYPES – USNM 297347 (12 specimens), ROM 71850 (5 specimens). *Monothrix polylepis* Ogilby, 1897: HOLOTYPE – AMS I. 3654.

American Dinematichthyini. See Møller *et al.* 2004a and 2005.

Brosmophycinae and Bythitinae. See Møller *et al.* 2004b.

SYSTEMATICS

Tribe Dinematichthyini Cohen and Nielsen, 1978

(family Bythitidae Gill, 1861;
subfamily Brosmophycinae Gill, 1862)

Diagnosis. Male copulatory organ with a penis and 1–2 (rarely 3) pairs of pseudoclaspers in cavity of ventral body wall covered by a fleshy hood. First anal fin pterygiophore slightly to strongly elongated. Head pore system generally unreduced, 6 mandibular, 2–4 preopercular, 5–7 infraorbital and 3–4 supraorbital pores, including supraorbital pore above opercular spine. Posteriormost supraorbital head pore tubular.

Comparison. The Dinematichthyini are best defined by the apomorphic position of the copulatory organ below a covering fleshy hood in a cavity of the ventral body wall (Sedor 1985; Møller *et al.* 2004a). In all other viviparous bythitids (Brosmophycini and Bythitinae), the copulatory organ is an integrated part of the fleshy genital hood, with the penis present as a small, soft papilla. Pseudoclasper-like structures, if present, are indistinct papillae with or without a slight sclerification in the form of a superficial thickening of the epidermis. The 3rd supraorbital head pore above the opercular spine is only known from one other bythitid genus outside the Dinematichthyini from *Brosmophycis* Gill, 1861. In *Brosmophycis* this pore is slit-like, not tubular as in the Dinematichthyini.

Key to Indo-West Pacific genera of the Dinematichthyini

1a. Maxilla not vertically expanded postventrally; head without scales; lower lip with folded papillae; upper preopercular pore absent; one pair of (outer) pseudoclaspers; otolith with separate colliculi 2

1b. Maxilla vertically expanded postventrally; head with scales patches, at least on cheek, but commonly also on operculum above and below opercular spine; lower lip without folded papillae; upper preopercular pore present or absent; two (rarely one) pairs of pseudoclaspers; otolith with fused or separate colliculi 4

2a. Opercular spine covered by skin, not exposed ..... *Dermatopsoides*

2b. Opercular spine free, exposed 3

3a. Precaudal vertebrae 11–14; dorsal fin rays ≤85..... *Dermatopsis*

3b. Precaudal vertebrae 14–23; dorsal fin rays >85..... *Dipulus*

4a. Precaudal vertebrae 13–15; average number of dorsal fin rays per ray-bearing vertebra 2.4–2.7; 1 (rarely two) pairs of pseudoclaspers 5

4b. Precaudal vertebrae 11–12 (*Dinematichthys dasyrhynchus* 14); average number of dorsal fin rays per ray-bearing vertebra 1.9–2.3; two pairs of pseudoclaspers 8

5a. Upper preopercular pore present 6

5b. Upper preopercular pore absent 7

6a. One pair of (outer) pseudoclaspers; squamation only on cheek; one pair of supraorbital pores on occiput; canine teeth present; otolith with fused colliculi.... ..... *Monothrix*

6b. Two pairs of pseudoclaspers, the inner being stick-like and extending centrally over the outer pseudoclasper; squamation on head continuous across cheek and operculum; five pairs of supraorbital pores on occiput; no canine teeth; otolith with separate colliculi..... ..... *Dinematichthys dasyrhynchus*

7a. One pair of (outer) pseudoclaspers; caudal vertebrae ≥42 ..... *Brosmolus*

7b. Two pairs of (centrally joined) pseudoclaspers; caudal vertebrae <38..... *Beaglichthys*

8a. Squamation on head continuous across cheek and operculum..... *Dinematichthys* (part)

8b. Squamation on head divided in separate patches on cheek and operculum 9

9a. Anterior nostril high on snout; otolith with separate colliculi; upper preopercular pore absent or present ..... *Dinematichthys* (part)

9b. Anterior nostril low on snout; otolith with fused colliculi; upper preopercular pore present (except absent in *Diancistrus manciporus*) 10

10a. One lower preopercular pore; inner pseudoclasper joined anteriorly to outer pseudoclasper to form a u-shaped feature; otolith length to sulcus length usually ≥2.4 ..... *Paradiancistrus* n. gen.

10b. Three lower preopercular pores (two of which are joined in a single opening); inner pseudoclasper joined anteriorly in various ways but not forming a u-shaped feature; otolith length to sulcus length usually ≤2.4 11

11a. Body robust, moderately slender to deep-necked (head height ≥15% SL except for *Diancistrus jeffjohnsoni*, body depth at anal ≥16% SL except for *Diancistrus longifilis*); precaudal vertebrae 11 (except 12 in *Diancistrus jeffjohnsoni*); maxilla with angular posteroventral widening close to its termination; body scales (1.2) 1.3–2.2% SL ..... *Diancistrus*

11b. Body slender (head height ≤15% SL, depth at anal ≤16% SL); precaudal vertebrae predominantly 12 (rarely 11); maxilla rounded posteroventrally with weak knob in front of rear corner; body scales small, <1.2% SL ..... *Brotulinella* n. gen.

Brotulinella n. gen.

(Tables 2–4)

Type species: *Brotulinella taiwanensis* n. sp. (type locality: southern tip of Taiwan Island, 21°N, 120°E).

Diagnosis. Anterior nostril placed low on snout; male copulatory organ with two pairs of pseudoclaspers, the outer large, broad and blade-like, the inner a mere fleshy appendix fused to the outer pseudoclasper anteriorly and without a supporter; eyes moderately large (1.8–2.6% SL); fishes small (maximum 60 mm SL, maturity reached at 35 mm SL), slender (head height ≤16% SL, depth at anal ≤16.5% SL); precaudal vertebrae 12 (rarely 11); head with scale patch only on cheek; otolith elongate, its sulcus inclined (5–10°), short (otolith length to sulcus length 2.2–2.4), with fused colliculi; maxilla rounded posteroventrally with weak knob in front of rear corner; anterior anal fin pterygiophore long.

Comparison. *Brotulinella* belongs among the dinematichthyine genera characterized by a combination of a low anterior nostril, two pairs of pseudoclaspers, a maxillary knob at the rear corner and an otolith with fused colliculi. Of the Indo-West Pacific genera so far described, *Dinematichthys s.l.* is distinguished by the high anterior nostril and an otolith with separate colliculi. The interrelated genera *Dermatopsis, Dermatopsoides* and *Dipulus* differ in the absence of a vertically extended posterior maxilla, the lack of scales on the head, a single pair of pseudoclaspers and an otolith with separate colliculi. The remaining genera in the Indo-West Pacific share the four characters mentioned for *Brotulinella* above, except for the genera *Brosmolus* and *Monothrix*, which have a single pair of pseudoclaspers. Both genera, and *Beaglichthys*, further differ from *Brotulinella* in the higher number of precaudal vertebrae (13–15 versus 12). *Brotulinella* differs from *Diancistrus* and *Paradiancistrus* n. gen. in its slender shape (head height ≤16% SL versus ≥15% SL and body depth at anal ≤16.5% SL versus ≥16% SL) and the predominantly 12 precaudal vertebrae (versus 11, except 12 in *Diancistrus jeffjohnsoni*). *Paradiancistrus* n. gen. is further distinguished by the presence of only one lower preopercular pore (versus 3). The broad, blade-like outer pseudoclasper with the inner pseudoclasper anteriorly joined as a fleshy flap without a supporter further distinguishes *Brotulinella* from *Diancistrus* and *Paradiancistrus* n. gen.

Of the American Dinematichthyini, *Ogilbia, Pseudogilbia* and *Ogilbichthys* are closest to *Brotulinella*. In these three genera, however, the inner pseudoclasper is free from the outer pseudoclasper and always contains a supporter. Otoliths of *Ogilbia* and some species of *Ogilbichthys* have separated colliculi, while some other species of *Ogilbichthys* and *Pseudogilbia* have fused colliculi like *Brotulinella*. *Ogilbichthys* is also readily recognized by the presence of two pairs of inner pseudoclaspers, a unique character in Dinematichthyini. *Pseudogilbia* finally shows a very different pseudoclasper arrangement (though with two pairs) and, like *Paradiancistrus* n. gen. only one lower preopercular pore.

Species. The genus is monotypic.

Etymology. The name refers to the genus *Brotulina*, now regarded as a junior synonym of *Diancistrus* (see below; type-species: *Brotulina fusca*, now *Diancistrus fuscus* known from the northern Philippines, Taiwan and the Ryukyu Islands) and the small size of the fishes of this genus. Gender: feminine.

Brotulinella taiwanensis n. sp.

(Figs 4–6; Table 1)

Material examined. (61 specimens, 23–60 mm SL). HOLOTYPE – USNM 221048, male, 43 mm SL, Taiwan, 21°N, 120°E (collector, method and date unknown). PARATYPES – ANSP 163510, 2 females, 35–49 mm SL and 1 juvenile, 31 mm SL, 20°24'N, 121°55'E, Batanes Province, white beach past Mahatae, Batan Island, surge channel at outer edge of reef flat, walls of channel rock, 0–6.5 m depth, Philippines, G.D. Johnson and W.F. Smith-Vaniz, 22 April 1987; ASIZP 59304, 1 male, 43 mm SL, Taiwan; BPBM 23339, 1 male, 36 mm SL and 1 female, 38 mm SL, Ch'uan-Fan-Shih, Taiwan, J.E. Randall, G.W. Tribble and R.P.H. Rutherford, 16 July 1978; USNM 318065, 1 male, 36.5 mm SL, Batan Island, Batanes Province, Philippines, 18°N, 121°E; USNM 366695, 1 male, 34 mm SL and 1 female, 49 mm SL, SW tip of Taiwan, V.G. Springer, 5 May 1968; USNM 374176, 2 males, 37–40 mm SL, 1 female, 50 mm SL and 1 juvenile 23 mm SL, Babuyan Islands, Maybag Island, middle of S coast of island, along shore, Philippines, C.A. Ross and V. Samarita, 8 March 1990; USNM 374178, 1 male, 38 mm SL and 4 females, 32–60 mm SL, 20°25'N, 121°57'E, Batan Island, Batanes Province, Philippines, G.D. Johnson *et al.*, 22 April 1987; USNM 374188, 1 male, 51 mm SL and 4 females, 31–45 mm SL, S shore of Taiwan, just S of cut between large outstanding rock and Ch'uan-Fan-Shih, Taiwan, V.G. Springer *et al.*, 24 April 1968; USNM 374189, 1 male, 51 mm SL, rocky headland NW of swimming beach of Sha Toa, Taiwan, J.H. Choat *et al.*, 5 May 1968; USNM 384606, 1 female, 43 mm SL, Taiwan, same location as holotype; ZMUC P 771468, 1 male, 52 mm SL, same data as USNM 374189; ZMUC P 771469, 1 female, 32 mm SL, same data as USNM 374178.

Additional specimens. USNM 221051, 2 females, 25 and 53 mm SL, Taiwan; USNM 263711, 3 males and 8 females, 30–54 mm SL, Taiwan, 21°55'N, 120°49'E; USNM 263726, 1 male and 1 female, 25–34 mm SL, Taiwan; USNM 300087, 3 females, 38–45 mm SL, Batanes Province, Philippines, 20°27'N, 121°57'E; USNM 300093, 2 females, 27 and 39 mm SL, Batanes Province, Philippines, 20°20'N, 121°49'E; USNM 300096, 1 female, 39 mm SL, Batanes Province, Philippines, 20°25'N, 121°56'E; USNM 366493, 2 males, 34–36 mm SL and 1 female, 30 mm SL, Taiwan, 21°55'N, 120°49'E; USNM 366564, 1 male, 40mm SL and 3 females, 35–54 mm SL, Taiwan; USNM 366565, 2 males and 2 females, 33–39 mm SL, Taiwan; USNM 367146, 1 male, 30 mm SL, Taiwan.

Table 1. Meristic and morphometric characters of *Brotulinella taiwanensis* n. sp.

	Holotype USNM 221048	Holotype + 27 paratypes	n
		Mean (range)	
Standard length in mm	43	41.0 (23-60)	28
Meristic characters			
Dorsal fin rays	78	73.3 (68-78)	26
Anal fin rays	57	56.7 (52-63)	26
Pectoral fin rays	17	18.8 (17-21)	25
Preaudal vertebrae	12	11.7 (11-12)	26
Caudal vertebrae	31	30.0 (29-31)	26
Total vertebrae	43	41.7 (40-43)	26
Rakers on anterior gill arch	12	14.0 (11-17)	26
Pseudobranchial filaments	2	2	26
D/V	7	6.5 (6-7)	26
D/A	20	21.2 (18-24)	26
V/A	15	14.2 (12-15)	26
Morphometric characters in % of SL			
Head length	22.4	24.9 (22.4-27.0)	28
Head width	10.5	11.2 (9.5-13.0)	27
Head height	12.9	14.3 (12.9-15.9)	27
Upper jaw length	11.0	12.1 (10.9-13.3)	27
Maxillary height	3.3	3.8 (3.2-4.5)	27
Diameter of pigmented eye	2.0	2.2 (1.8-2.9)*	28
Interorbital width	5.4	5.8 (4.8-7.2)	27
Postorbital length	16.3	18.0 (16.3-19.2)	27
Preanal length	49.3	48.1 (42.4-51.5)	27
Predorsal length	30.2	31.1 (28.4-33.2)	27
Body depth at origin of anal fin	13.8	14.5 (12.9-16.6)	27
Pectoral fin length	14.4	14.9 (13.3-17.3)	27
Pelvic fin length	broken	20.5 (16.9-25.3)	23
Base pelvic fin - anal fin origin	33.3	30.1 (25.0-34.3)	26

* Strong negative allometric change.

Diagnosis. See generic diagnosis.

Description. The principal meristic and morphometric characters are shown in Table 1. Body elongate, slender, head height ≤16% SL and body depth at anal ≤16.5%

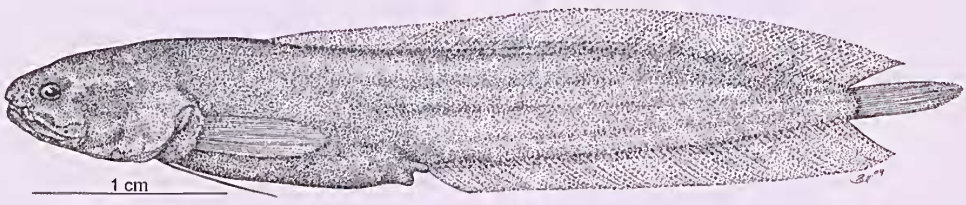

Fig. 4. *Brotulinella taiwanensis* n. sp. Holotype. USNM 221048, male, 43 mm SL.

SL. Eyes 1.8–2.9% SL. Head with scale patch on cheek containing up to 5 vertical rows of small scales. Maxillaries ending far behind eyes, dorsal margin of maxillaries covered by dermal lobe of upper lip, posterior end rounded, with weak knob on posterior ventral part but anterior to rear corner. Anterior nostril positioned low, 1/4 the distance from tip of snout to anterior margin of eye. Posterior nostril large, about 1/3 the size of eye. Opercular spine pointed, with free tip. Anterior gill arch with 11–17 rakers, including 3 elongate rakers in the angle. Pseudobranchial filaments 2. Scales on body embedded in skin, horizontal diameter 1.1% SL. Predorsal length 28–33% SL, anal fin origin just before mid-body, distance pelvic fin base to anal fin base mostly 25–34% SL. Pectoral fins reaching half way between verticals through anal and dorsal fin origins, 13–17% SL, pelvic short, 17–25% SL.

Head sensory pores (Fig. 5 A-B). Supraorbital pores 3: 1st pore in front of 2nd anterior infraorbital pore, 2nd pore indistinct, above and behind eye, 3rd pore tubular, at upper termination of gill opening above opercular spine. Infraorbital pores 6 (3 anterior and 3 posterior): 1st anterior pore behind anterior nostril, 2nd and 3rd anterior pores covered by dermal flap of upper lip, three posterior pores on rear part of upper lip. Mandibular pores 6 (3 anterior and 3 posterior): 1st anterior pore large and tubular, with a single cirrus anteriorly, 2nd pore positioned in lateral skin fold, 3rd anterior at anterior termination of jugular isthmus, three posterior pores on rear part of lower jaw. Preopercular pores 4 (3 lower and 1 upper): 1st and 2nd lower pores with joint opening; upper pore tubular.

Lateral line configuration indistinct.

Dentition (of holotype). Premaxilla with 4 rows of granular teeth and 1 row of larger teeth anteriorly, blending into a few rows of granular teeth posteriorly. Anterior-most teeth length up to 1/2 diameter of pupil. Vomer horseshoe-shaped, with one row of large fangs up to ½ diameter of pupil. Palatine teeth in 2 rows, slightly larger in inner row. Dentary with 3 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, blending into 1 row of 8 large fangs posteriorly, up to about 2/3 of pupil diameter.

Otolith (Fig. 5 G-H). Elongate in shape, length to height about 2.2 (36–43 mm SL). Anterior tip pointed; posterior tip more robust. Dorsal rim straight, with obtuse predorsal and prominent postdorsal angle; ventral rim shallow and gently curved. Inner face slightly convex; outer face smooth, flat. Otolith length to sulcus length 2.2 to 2.4. Sulcus with undivided margin and fused colliculi. Sulcus inclined to otolith axis at 5° to 10°. Ventral furrow distinct, close to ventral rim of otolith.

Axial skeleton. Neural and haemal spines slender, except for neural spines of vertebrae 3–4 (5) inclined and (5) 6–8 depressed, shorter in length than spines of 2nd–4th (5th) vertebrae. Bases of neural spines 5–9 enlarged. Parapophyses present from vertebra 6 to 11. Pleural ribs on vertebrae 2–11 (10), absent on last precaudal vertebra in all but one specimen. Epipleural ribs indistinct. First anal fin pterygiophore elongated, reaching tip of last precaudal parapophysis in males and just below in females.

Male copulatory organ (Fig. 5 C–F). Two pairs of pseudoclaspers; outer pseudoclasper large, broad, blade-

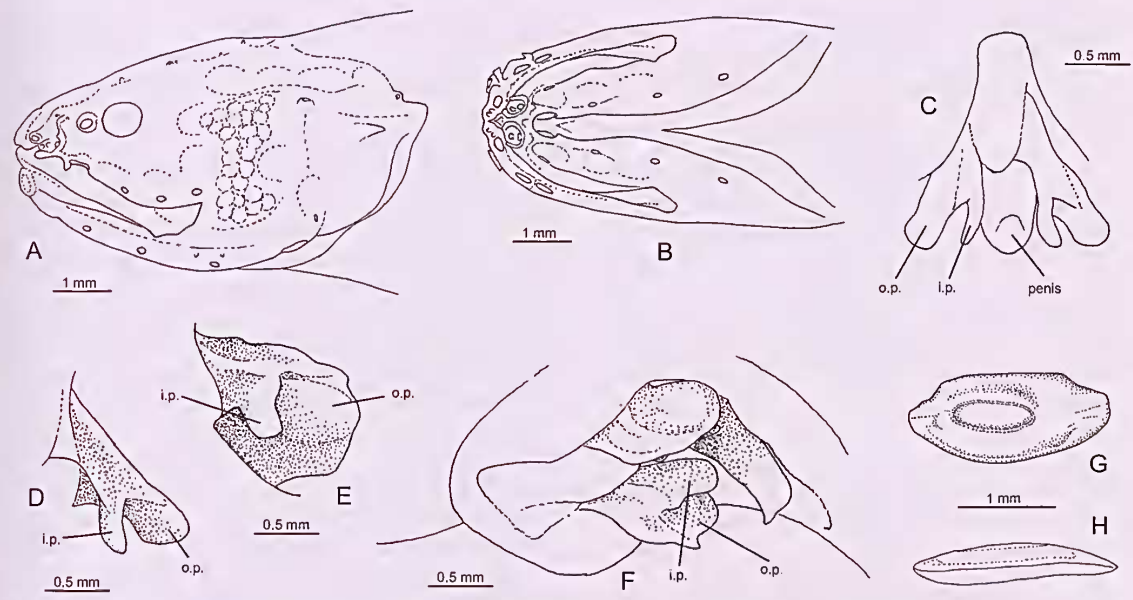

Fig. 5. *Brotulinella taiwanensis* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, ventral view of male copulatory organ, USNM 318065; **D**, ventral view of left pseudoclasper, USNM 318065; **E**, view of left pseudoclasper from inside, holotype; **F**, inclined lateral view of male copulatory organ, holotype; **G**, median view of right otolith, USNM 318065; **H**, ventral view of right otolith, USNM 318065.

shaped with a broad supporter. Inner pseudoclasper a long fleshy flap anteriorly joined to the outer pseudoclasper, almost reduced to an appendix without supporter. Penis not much longer than pseudoclaspers, curved, broad at basis.

Colour in alcohol. Live colour unknown. Light brown, head and upper 1/3 of body darker than flanks.

Comparison. See comparison between *Brotulinella* and other genera.

Distribution. Known from southern Taiwan and northern Philippines, chiefly Batanes Province (Fig. 6).

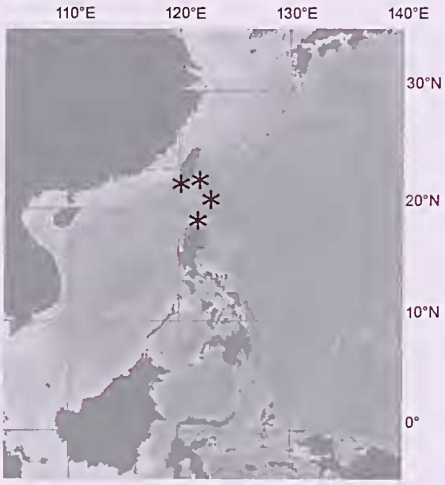

Fig. 6. Sample sites of *Brotulinella taiwanensis* n. sp. One symbol represents several samples.

Ecology. The species occurs in shallow water between rocks, mainly in surge channels.

Etymology. The name *taiwanensis* refers to the type locality, Taiwan, Republic of China.

Diancistrus Ogilby, 1899

(Tables 2–4)

Diancistrus Ogilby, 1899: 743 (type species *D. longifilis* Ogilby, 1899 by monotypy) (see Eschmeyer 1998).

Diancistrus – Cohen and Nielsen, 1978: 57; Paxton *et al.* 1989: 316; Nielsen *et al.* 1999: 128.

Brotulina Fowler, 1946: 195, figs 59–60 (type species *B. fusca* Fowler, 1946 by monotypy), 'new synonym'.

Brotulina – Cohen and Nielsen, 1978: 56; Nielsen *et al.* 1999: 125.

Calcarbrotula Fowler, 1946: 193, figs 57–58 (type species *C. erythraea* Fowler, 1946 by monotypy).

Parabrosmolus Machida, 1996: 147, figs 1–4 (type species *P. novaeguineae* Machida, 1996 by monotypy), 'new synonym'.

Parabrosmolus – Nielsen *et al.* 1999: 124.

Diagnosis. Anterior nostril placed closer to upper lip than to posterior nostril; tip of opercular spine free; male copulatory organ with two pairs of mostly highly diverse and specific pseudoclaspers, the outer pseudoclasper being the larger and more diverse; inner pseudoclasper small, positioned near anterior edge of outer pseudoclasper and joined to it in various degrees, rarely free (in *D. alatus* n. sp., *D. megrouthieri* n. sp. and *D. tongaensis* n. sp.); otoliths with fused colliculi; otolith length to sulcus length <2.2; sulcus not inclined; anterior anal fin ray pterygiophore long; lower preopercular pores 3 (2 lower and 1 upper); upper preopercular pore present (except absent in *D. manciporus* n. sp.); ventral maxillary knob at rear corner; precaudal vertebrae usually 11 (12 in *D. jeffjohnsoni* n. sp.); body robust, moderately slender to high-necked (head height ≥15% SL in adults, except for *D. jeffjohnsoni* n. sp. and depth at anal ≥16% SL except for *D. longifilis*); dentary with large fang-like teeth posteriorly, of about 1/3 to 2/3 of pupil width.

Description. Vertebrae 11–12+28–35 = 39–46, dorsal fin rays 66–91, anal fin rays 54–74, pectoral fin rays 16–21, ventral fin rays 2, caudal fin rays 15–17 (almost always 16), D/V = 5–7, D/A = 17–24, V/A = 12–15. Body robust, often deep-necked, head slender or massive, moderately to strongly compressed. Body covered with small scales, head with scale patch on cheek and many species also with scales on operculum. Maxillary ending far behind eyes, dorsal margin covered by dermal lobe of upper lip, expanded posteriorly, angular or with knob at ventral rear corner. Anterior nostril placed low on snout, close to upper lip. Tip of opercular spine free, pointed. Anterior gill arch with 12–18 rakers, thereof 2–4 (usually 3) elongate rakers in an uninterrupted row at the angle. Pseudobranchial filaments 0–2 (almost always 2). Pectoral fin length 13–20% SL; pelvic fin length mostly 20–30% SL. Dorsal fin originates at about 1/3 from body length, predorsal mostly at 30–37% SL; anal fin origin at about mid-body, preanal mostly 43–53% SL; distance of pelvic fin base to anal fin base 21–32% SL. Caudal fin free, rounded. Positive allometric growth sometimes observed in body depth (depth at anal fin origin) and head length.

Head pore system includes: Supraorbital pores 3: 1st at tip of snout, 2nd above and behind eye and 3rd above opercular spine; infraorbital pores 6 (3 anterior and 3 posterior): 1st anterior pore behind anterior nostril, 2nd and 3rd anterior pores covered by dermal flap of upper lip, three posterior pores on rear part of upper lip; mandibular pores 6 (3 anterior and 3 posterior): 1st anterior pore at tip of lower jaw, 2nd anterior pore positioned in lateral skin fold, 3rd anterior at anterior termination of jugular isthmus, three posterior pores on rear part of lower jaw: preopercular pores 4 (3 lower and 1 upper): 1st and 2nd lower pores with joint openings, 3rd pore just above, upper preopercular pore behind and above cheek scale patch (absent in *D. manciporus* n. sp.).

Teeth pointed and granular, present on palatine, vomer, premaxilla and dentary.

Lateral line system often indistinct. When observable, consisting of short dorsal row from behind opercular opening to vertical line through anal fin origin and

Table 2. Comparison of key characters of species of the genera *Brotuliuella* n. gen, *Diancistrus* and *Paradiancistrus* n. gen. *Diancistrus* species groups refer to: 1a = *Diancistrus altidorsalis* subgroup, 1b = *Diancistrus erythracus* subgroup, 2a = *Diancistrus longifilis* subgroup, 2b = *Diancistrus springeri* subgroup, 3a = *Diancistrus fijiensis* subgroup, 3b = *Diancistrus katrinae* subgroup.

		pseudoclaspers							scales on operculum					eye size					vertebrae				
	Diancistrus species group	ear-lobe	hook-like	stick-like	wing and inner bifurcate	wing and inner single	inner and outer cramp like	inner fleshy flap extension	continuous scales patch above and below op. spine	separate scale patches above and below op. spine	scale patch above op. spine >4, arranged in 2–3 rows	scale patch above op. spine <4, arranged in 1 row	no scales on operculum	eye size <1.5% SL	eye size 1.5-2.0% SL	eye size 2.0-2.5% SL	eye size 2.5-3.0% SL	eye size >3.0% SL	total vertebrae 39-41	total vertebrae 42	total vertebrae 43	total vertebrae 44-45	total vertebrae 46
D. altidorsalis n. sp.	1a	x								x							x	x			x	x	
D. niger n. sp.	1a	x											x					x	x	x	(x)			
D. atolloruu n. sp.	1b	x											x	(x)	x				x	(x)				
D. erythraeus	1b	x											x	x	(x)				x					
D. mcgroutheri n. sp.	1b	x											x		x				x					
D. robustus n. sp.	1b	x											x		x						x			
D. tougacusis n. sp.	1b	x											x	(x)	x	(x)			x	x				
D. sp. 3	1b												x		x				x					
D. alleui n. sp.	2a		x									x					x	(x)			x	x		
D. beateae n. sp.	2a		x						x								x	x				x	x	
D. fuseus	2a		x								x						x	x			x	x		
D. longifilis	2a		x									(x)	x			(x)	x	(x)			x	x		
D. machidai n. sp.	2a		x									(x)	x				x	x	x	x				
D. mauciporus n. sp.	2a		x										x				x	x			x	x		
D. novaeguineae	2a		x							(x)	x					x	x	x			x	x		
D. vietnamensis n. sp.	2a		x								x					x	x			(x)	x	x		
D. leisi n. sp.	2b			x									x		x				x					
D. springeri n. sp.	2b			x							x							x				x		
D. sp. 1	3												x			x	x					x		
D. alatus n. sp.	3a				x								x				x			x				
D. brevirostris n. sp.	3a				x								x			x	x				x	x		
D. fijiensis n. sp.	3a				x								x			(x)	x	x		x	x	x		
D. jackrandalli n. sp.	3a				x							x			x				x					
D. eremitus n. sp.	3b					x					x							x		x		x		
D. karinae n. sp.	3b					x			x								(x)	x			(x)	x	(x)	
D. jeffjohnsoni n. sp.	3b					x						x					x			x	x	x		
D. mennei n. sp.	3b					x					x							x				x		
D. polupeiensis n. sp.	3b					x						x						x				x	x	
D. katrinae n. sp.	3b					x				x						x	x					x	(x)	
D. sp. 2	3b					x					x						x					x		
Paradianeistrus acutirostris n. sp.							x						x				x				x	x		
Paradiancistrus cuyoensis n. sp.							x						x			x				x	x			
Brotuliuella taiwanensis n. sp.								x					x		(x)	x	(x)		x	x	x			

Table 3. Frequency distribution of dorsal fin ray counts of the species of the genera *Brotulinella* n. gen., *Diancistrus* and *Paradiancistrus* n. gen. *Diancistrus* species groups refer to: 1a = *Diancistrus altidorsalis* subgroup, 1b = *Diancistrus erythraeus* subgroup, 2a = *Diancistrus longifilis* subgroup, 2b = *Diancistrus springeri* subgroup, 3a = *Diancistrus fijiensis* subgroup, 3b = *Diancistrus katrineae* subgroup.

	Diancistrus species group	dorsal finrays																										
		65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
D. altidorsalis n. sp.	1a												1	3	5	8	3	3	4	1	-	3							
D. niger n. sp.	1a					1	-	1	-	-	2	2	1																
D. atollorum n. sp.	1b								4	5	3	4	2																
D. erythraeus	1b						1	1	1	4	1	1	2																
D. mcgroutheri n. sp.	1b								4	6	1	2	1	1															
D. robustus n. sp.	1b													1															
D. tongaensis n. sp.	1b							1	3	3	4	4	3	3	3	2	1												
D. sp. 3	1b								1	-	1																		
D. alleni n. sp.	2a											2	6	2	10	11	7	8	3	4	1								
D. beateae n. sp.	2a																				7	7	8	6	4	6	3	4	
D. fuscus	2a										1	1	1	4	4	4	4	2	4	1	1	1							
D. longifilis	2a													2	4	1	5	7	6	7	2	2							
D. machidai n. sp.	2a		1	1	-	-	1	-	2	-	1	2	1	1															
D. manciporus n. sp.	2a															1	1	1	-	1	1								
D. novaeguineae n. sp.	2a										2	-	2	1	3	2	8	4	1	-	1	1							
D. vietnamensis n. sp.	2a					1	1	-	1	2	3	4	2	3	-	1	1												
D. leisi n. sp.	2b					1	1	-	-	1																			
D. springeri n. sp.	2b														1	1	-	3	-	1	1								
D. sp. 1	2																			1	-	-	-	-	1	1			
D. alatus n. sp.	3a															1													
D. brevirostris n. sp.	3a							1	-	-	-	1	1	-	1	1	1	-	1										
D. fijiensis n. sp.	3a						(1)	-	-	-	1	3	4	3	3	-	1	2											
D. jackrandalli n. sp.	3a												1	1	-	1													
D. eremitus n. sp.	3b																			1	2	2	1						
D. karinae n. sp.	3b														2	1	3	4	-	3									
D. jeffjohnsoni n. sp.	3b						3	2	2	4	6	2	2	3															
D. mennei n. sp.	3b																								1				
D. pohnpeiensis n. sp.	3b																			1	2	1							
D. katrineae n. sp.	3b														1	1	3	1	-	1	2	3	2						
D. sp. 2	3b																			1									
Paradiancistrus acutirostris n. sp.																		1	-	-	-	-	-	1					
Paradiancistrus cuyoensis n. sp.												1	-	-	-	-	1												
Brotulinella taiwanensis n. sp.				1	1	2	2	1	5	5	4	2	2	1															

Table 4. Comparison of selected morphometric characters of the species of the genera *Brotulinella* n. gen., *Diancistrus* and *Paradiancistrus* n. gen. *Diancistrus* species groups refer to: 1a = *Diancistrus altidorsalis* subgroup, 1b = *Diancistrus erythraeus* subgroup, 2a = *Diancistrus longifilis* subgroup, 2b = *Diancistrus springeri* subgroup, 3a = *Diancistrus fijiensis* subgroup, 3b = *Diancistrus katrineae* subgroup.

		Head length						Head height								Depth at anal fin origin						Body scales				
	Diancistrus species group	<25% SL	25 - 26% SL	26 - 27% SL	27 - 28% SL	28 - 29% SL	>29% SL	<14% SL	14 - 15% SL	15 - 16% SL	16 - 18% SL	18 - 20% SL	20 - 22% SL	22 - 24% SL	>24% SL	<14% SL	14 - 16% SL	16 - 18% SL	18 - 20% SL	20 - 22% SL	>22% SL	<1.2% SL	1.2 - 1.4% SL	1.5 - 1.6% SL	1.7 - 1.9% SL	>1.9% SL
D. altidorsalis n. sp.	1a			x	x	x					x	x	x						x	x	x				x	
D. niger n. sp.	1a					x	x				x	x								x	x		x			
D. atollorum n. sp.	1b			x	x	x					x	(x)						x	x							x
D. erythraeus	1b			x	x	x					x	(x)						x	x				x			
D. mcgroutheri n. sp.	1b			x	x	x				x	x							x	x				x			
D. robustus n. sp.	1b					x							x							x					x	
D. tongaensis n. sp.	1b				x	x					x	x						x	x					x		
D. sp. 3	1b				x					x	x								x	x						
D. alleni n. sp.	2a			x	x	x				x	x	x	x					x	x						x	
D. beateae n. sp.	2a				(x)	x	x					x	x	x	x				x	x	x				x	
D. fuscus	2a		x	x	(x)					x	x	x	x					x	x				x			
D. longifilis	2a		x	x	x				x	x	x						x	x					x			
D. machidai n. sp.	2a		x	x	x				x	x	x	x					x	x	x				x			
D. manciporus n. sp.	2a			x	x	x					x							x						x		
D. novaeguineae n. sp.	2a			x	x	x				x	x	x					x	x	x				x			
D. vietnamensis n. sp.	2a	(x)	x	x	x							x	x	x				x	x	x			x			
D. leisi n. sp.	2b			x	x	x	x			x	x							x					x			
D. springeri n. sp.	2b			x	x	x					x	(x)						x	x						x	
D. sp. 1	2		x	x	x				x	x							x									
D. alatus n. sp.	3a				x						x						x								x	
D. brevirostris n. sp.	3a	x	x	x					x	x	x	x	(x)					x	x						x	
D. fijiensis n. sp.	3a	x	x	x						x	x	x	(x)					x							x	
D. jackrandalli n. sp.	3a				x							x							x	x			x			
D. eremitus n. sp.	3b			x	x	x	x					x	x	x					x	x				x		
D. karinae n. sp.	3b		x	x	x	x				x	x	x						x	x							x
D. jeffjohnsoni n. sp.	3b	x	x	x					x	x	x						x	x					x			
D. mennei n. sp.	3b			x	x						(x)		x	x					x					x		
D. polmpeiensis n. sp.	3b		x	x									x	x					x					x		
D. katrineae n. sp.	3b			x	x							x	x					x	x	x						x
D. sp. 2	3b				x								x						x							
Paradiancistrus acutirostris n. sp.						x							x						x						x	
Paradiancistrus cuyoensis n. sp.					x	x							x		x				x	x						x
Brotulinella taiwanensis n. sp.		x	x	(x)				x	x	x						x	x					x				

mediolateral row from vertical line through anal fin origin to caudal fin origin.

Otolith thin, moderately elongate to elongate. Sulcus with fused colliculi and no notch at ventral sulcus margin; otolith length to sulcus length ≤2.4; sulcus not inclined. Shape of otolith characterized by usually deep ventral rim and marked concavities at dorsal rim, one in front of predorsal, the other behind postdorsal angle. Anterior tip usually pointed; posterior tip pointed, but usually broader than anterior tip.

Neural and haemal spines slender, except for neural spines of vertebrae 4 (and 5) inclined and (5) 6–8 (9) depressed, shorter in length than spines of 2nd–4th vertebrae. Bases of neural spines 5–9 enlarged. Parapophyses present from vertebra (6) 7 to 10 (11). Pleural ribs on vertebrae 2–11 (10), present or absent on last precaudal vertebra. Epipleural ribs indistinct. First anal fin pterygiophore elongated, reaching tip of last precaudal parapophysis or just below it, usually longer in males than in females.

Male copulatory organ with two pairs of mostly highly diverse and specific pseudoclaspers (see section below).

Live coloration uniformly yellow, greenish, brownish or reddish, without marks, but unknown for most species. Preserved colour usually light to dark brown.

Comparison. *Diancistrus* is a common and the most speciose genus in the West Pacific. It is often confused with *Dinematichthys*, but pseudoclaspers of *Diancistrus* are generally much larger compared to *Dinematichthys*, so that in most instances both genera are easily distinguished. In *Diancistrus* the outer pseudoclasper is expanded in a wing, hook or ear-lobe shaped manner and the inner pseudoclasper is attached to the outer pseudoclasper anteriorly, whereas in *Dinematichthys* the outer and inner pseudoclaspers are simple flap- or stick-like structures with the inner pseudoclasper inserted at about the middle of the base of the outer pseudoclasper. Another character, often found in keys to distinguish *Dinematichthys* from other Dinematichthyini, the high position of the anterior nostril, is not as reliable in respect to *Diancistrus*, which often shows intermediate positions of the anterior nostril, somewhat higher above the snout than usual in non-*Dinematichthys* genera. A very reliable and recommendable character to distinguish both genera in the case of females is the otoliths: those of *Dinematichthys s.l.* always have clearly separated colliculi, whereas those of *Diancistrus* always have completely fused colliculi. Also, the teeth in *Diancistrus* are generally longer than those found in *Dinematichthys* as observed already by Ogilby (1899: 730).

The genera *Dermatopsis*, *Dermatopsoides* and *Dipulus* are readily distinguished from the other Indo-West Pacific genera so far described by the absence of a vertically expanded posterior maxilla, the lack of scales on the head, the single pair of pseudoclaspers and the otolith with separate colliculi. *Beaglichthys*, *Brosmolus* and *Monothrix* differ from *Diancistrus* (and *Brotulinella* and *Paradiancistrus* n. gen.) in the higher number of precaudal vertebrae (13–15 versus 11–12). *Brosmolus* and *Monothrix* have a single pair of pseudoclaspers. In respect to the differences of *Diancistrus* from *Brotulinella* see above. *Paradiancistrus* n. gen. is distinguished from *Diancistrus* by the presence of only 1 lower preopercular pore (versus 3) and the curved feature of the inner pseudoclasper (Figs. 72, 74).

Remarks. *Diancistrus* was recognized as a valid genus in Cohen and Nielsen (1978) as well as Nielsen *et al.* (1999), but as monotypic and restricted to the Lord Howe Island in the South-West Pacific. *Brotulina* was regarded as valid from the Ryukyu Islands, while *Calcarbrotula*, established by Fowler from a single female from the Ryukyus, was considered a junior synonym of *Brotulina*. The monotypic *Parabrosmolus* was also regarded as valid and placed in the Brosmophycini following Machida's (1996) statement of its lacking ossified elements in the male intromittant organ. As extensively discussed in Møller *et al.* (2004a), this character is no longer regarded as valid for distinguishing Brosmophycini and Dinematichthyini. Instead, the latter is now defined by their male copulatory organ having a penis and 1–2 (rarely 3) pairs of pseudoclaspers in a cavity of the ventral body wall covered by a fleshy hood (see above).

A review of all involved type specimens clearly shows that all four nominal genera can conveniently be placed in a single genus, for which the hitherto little used genus name *Diancistrus* has priority. The three male holotypes of the type species of *Diancistrus*, *Brotulina* and *Parabrosmolus* exhibit pseudoclaspers with a hook- or stick-shaped outer pseudoclasper characteristic for one of the main species groups of *Diancistrus* (see below). For *Calcarbrotula erythraea*, which was based on a single female, males are now well documented in the material available and it clearly belongs to a second species group with ear-lobe shaped outer pseudoclaspers (see below). In fact, with the description of 23 new species the genus *Diancistrus* now comprises a total of 27 species and thus forms the most species-rich genus of the Dinematichthyini. Other very speciose genera are *Ogilbia* with 18 species (see Møller *et al.* 2005) from American waters and *Dinematichthys s.l.* with many undescribed species (under review). In abundance of specimens, the species of the genus *Diancistrus* are second in the Indo-West Pacific, surpassed only by those of the genus *Dinematichthys s.l.*

Distribution. *Diancistrus* is widespread in the Indo-West Pacific from the Chagos Islands in the western Indian Ocean to Pitcairn and Ducie Atoll in the central Pacific. Only *Dinematichthys s.l.* is more widespread, reaching the eastern Indian Ocean and in being represented by a single species in the Caribbean. The high diversity observed in *Diancistrus* clearly has to do with geographical endemics in many areas and the (common) presence of several species per region (three to five species of *Diancistrus* occurring together is not rare), but there are also notable exceptions

of a few widespread species (for instance *D. alleni* n. sp., *D. beateae* n. sp. or *D. katrineae* n. sp.).

Ecology. The species of *Diancistrus* are typically reef dwelling, most commonly associated with live coral reefs. They are less commonly observed in lagoonal environments. The only species and record from a non-reef related cave environment is *Diancistrus katrineae* n. sp. from Rapa, Tubuai Islands. *Diancistrus* specimens are generally caught in association with species of the genus *Dinematichthys,* which then usually constitute the larger proportion in terms of specimens with ratios ranging from about 3:1 to about 10:1. In various locations up to three, sometimes four, different species of *Diancistrus* have been caught simultaneously. This is the highest density of dinematichthyine species per genus observed at any location.

Species groups. *Diancistrus* is the most speciose genus of the Dinematichthyini with 27 species described in the following and three further species left in open nomenclature because of lack of adequate material. The body proportions and sizes show more variation than found in most other dinematichthyine genera and so do the meristic values, except for the precaudal vertebrae count, which is amazingly constant. The most universally useful character in *Diancistrus* is, like for all other dinematichthyine genera, the highly diagnostic and diverse male copulatory organ, except for a pair of species (*D. longifilis* – *D. manciporus* n. sp.) and a trio of species (*D. fuscus* – *D. vietnamensis* n. sp. – *D. alleni* n. sp.) with similar pseudoclaspers. Another very useful character to distinguish species of the genus *Diancistrus* is the head squamation, particularly the presence, number and orientation of scales on the operculum. Their exact evaluation, however, requires a certain treatment (see chapter 'Definition of Characters' above).

The species of the genus *Diancistrus* can be arranged into species groups according to the pseudoclasper organization and the head squamation as follows:

Pseudoclasper species grouping.

1) *Diancistrus altidorsalis* n. sp. / *erythraeus* species group: outer pseudoclasper ear-lobe shaped (Fig. 2C). This group can be subdivided into the *Diancistrus altidorsalis* n. sp. subgroup characterized by atrophied inner pseudoclaspers without supporter and large eyes (≥2.5% SL) containing *D. altidorsalis* n. sp. and *D. niger* n. sp., and the *Diancistrus erythraeus* subgroup characterized by an inner pseudoclasper with supporter and small eyes (≤2.0% SL) consisting of *D. atollorum* n. sp., *D. erythraeus, D. mcgroutheri* n. sp., *D. robustus* n. sp. and *D. tongaensis* n. sp.

2) *Diancistrus longifilis / springeri* n. sp. species group: outer pseudoclasper hook- or stick- like (Fig. 2E). This group contains two subgroups, the *Diancistrus longifilis* subgroup with hook-like outer pseudoclaspers with *D. alleni* n. sp., *D. beateae* n. sp., *D. fuscus, D. longifilis, D. machidai* n. sp., *D. manciporus* n. sp., *D. novaeguineae* and *D. vietnamensis* n. sp., and the *Diancistrus springeri* n. sp. subgroup with the species *D. leisi* n. sp. and *D. springeri* n. sp.

3) *Diancistrus fijiensis* n. sp. / *katrineae* n. sp. species group: outer pseudoclasper flat, wing-shaped (Fig. 2B). This group can be subdivided into the *Diancistrus fijiensis* n. sp. subgroup characterized by a bifurcate inner pseudoclasper comprising the species *D. alatus* n. sp., *D. brevirostris* n. sp., *D. fijiensis* n. sp. and *D. jackrandalli* n. sp., and a second *Diancistrus katrineae* n. sp. subgroup characterized by a single-tipped inner pseudoclasper, which often extends anteriorly over the outer pseudoclasper containing *D. erenitus* n. sp., *D. jeffjohnsoni* n. sp., *D. karinae* n. sp., *D. katrineae* n. sp., *D. wennei* n. sp. and *D. polnpeiensis* n. sp.

Head squamation grouping.

1) Species with a continuous scale patch on the operculum extending above and below the opercular spine: *D. beateae* n. sp. and *D. karinae* n. sp.

2) Species with two separate scale patches on the operculum, one above and one below the opercular spine: *D. altidorsalis* n. sp., *D. katrineae* n. sp. and *D. novaeguineae* (large specimens only).

3) Species with scales on the operculum only above the opercular spine. This group can be subdivided into one subgroup with ≥4 scales above the opercular spine arranged in 2 to 3 rows comprising *D. wennei* n. sp., *D. erenitus* n. sp., *D. fuscus, D. novaeguineae* (most specimens), *D. springeri* n. sp. and *D. vietnamensis* n. sp., and another subgroup with <4 scales above the opercular spine arranged in a single row containing *D. alleni* n. sp., *D. jackrandalli* n. sp., *D. jeffjohnsoni* n. sp., *D. machidai* n. sp. (in part) and *D. polnpeiensis* n. sp.

4) Species without scales on the operculum. This is the largest group containing *D. alatus* n. sp., *D. atollorum* n. sp., *D. brevirostris* n. sp., *D. erythraeus, D. fijiensis* n. sp., *D. leisi* n. sp., *D. longifilis, D. machidai* n. sp. (in part), *D. mcgroutheri* n. sp., *D. manciporus* n. sp., *D. niger* n. sp., *D. robustus* n. sp. and *D. tongaensis* n. sp.

Further research and confirmation is required to judge whether the pseudoclasper or head squamation groupings or a combination thereof are monophyletic. Therefore, in the following the species are described in alphabetical order and without grouping. Comparison to other species is restricted to species within a specific species group, defined by pseudoclasper morphology (see above) and sympatric species.

The following descriptions of *Diancistrus* species takes into consideration all characters and methods investigated, but nevertheless makes significant use of pseudoclasper morphology. Obviously, without pseudoclasper information certain species can not definitely be distinguished. In these species females may be assigned to species when collected together with males of the respective species at the same location. Where this is not the case, such females will have to remain unidentified.

Key to the species of *Diancistrus*

1a. Outer pseudoclasper ear-lobe shaped; no scales on operculum (except scales present on operculum in *D. altidorsalis*) 2
1b. Outer pseudoclasper hook, stick or wing shaped (the latter sometimes with concave inner face superficially resembling ear-lobe form); scales on operculum present or absent 8
2a. Eyes large (>2.5% SL); inner pseudoclasper atrophied without supporter 3
2b. Eyes small (<2.0% SL); inner pseudoclasper with supporter 4
3a. Total vertebrae 43–45; scales present on operculum above opercular spine (6–9) and in separate patch below opercular spine (1–3); body scales >1.5% SL; colour light ..... *Diancistrus altidorsalis* n. sp.
3b. Total vertebrae 41–42 (rarely 43); no scales on operculum; body scales <1.5% SL; colour black .... *Diancistrus niger* n. sp.
4a. Total number of vertebrae 43; head massive (width >16% SL) ..... *Diancistrus robustus* n. sp.
4b. Total number of vertebrae 39–42; head slender (width ≤16% SL) 5
5a. Inner pseudoclasper joined anteriorly to outer pseudoclasper; scale patch on lower cheek in 2 rows 6
5b. Inner pseudoclasper free from anterior part of outer pseudoclasper; scale patch on lower cheek in 3–4 rows 7
6a. Inner pseudoclasper a small hook, ear-lobe shaped extension of outer pseudoclasper short and half-moon shaped; otolith length to height ratio 2.0; body scales <1.5% SL ..... *Diancistrus erythraeus* n. sp.
6b. Inner pseudoclasper forming a forward-inclined ear-lobe shaped extension, ear-lobe shaped extension of outer pseudoclasper complete; otolith length to height ratio >2.1; body scales >1.9% SL .... *Diancistrus atollorum* n. sp.
7a. Inner pseudoclasper forming a sharp, forward-inclined thorn or lobe, ear-lobe shaped extension of outer pseudoclasper short, confined to rear half .... *Diancistrus mcgroutheri* n. sp.
7b. Inner pseudoclasper forming a broad, distally expanded flap, ear-lobe shaped extension of outer pseudoclasper well developed along entire length . ..... *Diancistrus tongaensis* n. sp.
8a. Outer pseudoclasper hook- or stick-shaped 9
8b. Outer pseudoclasper wing-shaped (Fig. 2B)..... 20
9a. Outer pseudoclasper stick-shaped; inner pseudoclasper thin, almost as long as outer pseudoclasper..... 10
9b. Outer pseudoclasper hook-shaped (Fig. 2E); inner pseudoclasper much smaller than outer pseudoclasper, usually about half the length..... 11
10a. Scale patch (7–8 scales) above opercular spine; eyes large (size >2.8% SL); total vertebrae 44–45; dorsal fin rays 78–84; body scales >1.7% SL..... ..... *Diancistrus springeri* n. sp.
10b. No scales on operculum; eye small (size <2.0% SL); total vertebrae 41; dorsal fin rays 69–73; body scales <1.5% SL ..... *Diancistrus leisi* n. sp.
11a. Operculum with scales above and below opercular spine 12
11b. Operculum with scales only above opercular spine or without scales..... 13
12a. Continuous squamation on operculum above and below opercular spine; dorsal fin rays 84–91; anal fin rays 65–74; outer pseudoclasper broad, hook-shaped; inner pseudoclasper stout, fleshy, thick; body scales >1.7% SL ..... *Diancistrus beateae* n. sp.
12b. Squamation on operculum interrupted above and below opercular spine; dorsal fin rays 74–85; anal fin rays 60–69; outer pseudoclasper slender, hook-shaped; inner pseudoclasper stout, with broad fleshy appendix; body scales <1.5% SL..... *Diancistrus novaeguineae* [large specimens only]
13a. Scales present above opercular spine.....14
13b. No scales above opercular spine (except rarely in *D. machidai* n. sp.) 18
14a. Two or three rows of scales above opercular spine with >3 scales 15
14b. Single row with 1–2 (rarely 3) scales above opercular spine 17
15a. Three rows of mostly ≥7 (rarely 6) scales above opercular spine; inner pseudoclasper stout, with broad fleshy appendix ....*Diancistrus novaeguineae* [most specimens]
15b. Two rows of scales above opercular spine with 3–7 scales; inner pseudoclasper stout, thick, with small fleshy appendix 16
16a. Dorsal fin rays usually >77 (74–85); otolith length to sulcus length ≤2.0, sulcus not inclined; dorsal head profile not elevated.....*Diancistrus fuscus*
16b. Dorsal fin rays usually <77 (69–80); otolith length to sulcus length ≥2.3, sulcus inclined; dorsal head profile elevated (Figs. 66, 67A) ....*Diancistrus vietnamensis* n. sp.
17a. Dorsal fin rays 66–77; total vertebrae 40–42 (rare 43); inner pseudoclasper narrow, pointed; hook-like extension of outer pseudoclasper straight; body scales <1.5% SL .....*Diancistrus machidai* n. sp.
17b. Dorsal fin rays 75–84; total vertebrae 43–45; inner pseudoclasper stout, fleshy; hook-like extension of outer pseudoclasper bent outwards; body scales >1.7% SL .....*Diancistrus alleni* n. sp.
18a. Dorsal fin rays ≤77 (66–77); inner pseudoclasper narrow, pointed; hook-like extension of outer pseudoclasper about twice the length of anteriorly pointed inner pseudoclasper [specimens can have one or two scales above opercular spine] ....*Diancistrus machidai* n. sp.
18b. Dorsal fin rays ≥77 (77–85); inner pseudoclasper wide, concave; hook-like extension of outer pseudoclasper less than twice the length of inner pseudoclasper 19

19a. Upper preopercular pore present .... *Diancistrus longifilis* n. sp.

19b. Upper preopercular pore absent (Fig. 50A) .... *Diancistrus unauciporus* n. sp.

20a. Inner pseudoclasper free, broad-based, bifureate, usually not extending over anterior part of outer pseudoclasper 21

20b. Inner pseudoclasper joined to outer pseudoclasper anteriorly, narrow-based, thin, with single pointed tip, usually extending over anterior part of outer pseudoclasper 24

21a. Two scales above opercular spine; eye small (≤2.1% SL); total vertebrae 40–41; inner pseudoclasper short, without spines; body scales <1.5% SL ....*Diancistrus jackrandalli* n. sp.

21b. No scales above opercular spine; eyes large (>2.1% SL); total vertebrae 42–44; inner pseudoclasper with long bifurcate portions; body scales >1.7% SL... 22

22a. Anterior branch of inner pseudoclasper twice as long as posterior branch, both with rounded tip ....*Diancistrus alatus* n. sp.

22b. Both branches of inner pseudoclasper sharp and of about equal length 23

23a. Branches of inner pseudoclasper broad based, flap-like.....*Diancistrus brevirostris* n. sp.

23b. Branches of inner pseudoclasper thin, thorn-like... ..... *Diancistrus fijiensis* n. sp.

24a. Scales on opercuIum present above and below opercular spine; body scales >2.0% SL 25

24b. Scales on opercuIum present only above opercular spine; body scales <1.7% SL 26

25a. Continuous squamation on operculum above and below opercular spine; head slender; outer pseudoclasper flat..... *Diancistrus kariuae* n. sp.

25b. Squamation on operculum interrupted, above opercular spine 13–21 scales, below opercular spine 3–7 scales; head massive; outer pseudoclasper with concave inner face..... *Diancistrus katrineae* n. sp.

26a. Precaudal vertebrae 12 (rarely 11); dorsal fin rays 70–77; anal fin rays 55–63; single scale above opercular spine; outer pseudoclasper flat; otolith with regularly curved dorsal rim .. *Diancistrus jeffjohnsoni* n. sp.

26b. Precaudal vertebrae 11; dorsal fin rays >77; anal fin rays ≥62; number of scales above opercular spine >1; otoliths of males with postdorsal angle..... 27

27a. Scale patch above opercular spine with 3 rows and 7–9 scales; outer pseudoclasper flat, short (about 1 1/2 the length of inner pseudoclasper) ....*Diancistrus meunei* n. sp.

27b. Scale patch above opercular spine with 1–2 rows and 2–5 scales; outer pseudoclasper with concave inner face 28

28a. Scales above opercular spine 4–5 in 2 rows; total vertebrae 42–44; D/A 22–24; outer pseudoclasper without fleshy bulge posteriorly..... .....*Diancistrus eremitus* n. sp.

28b. Scales above opercular spine 2–3 in 1 row; total vertebrae 45–46; D/A 20–22; outer pseudoclasper with fleshy bulge posteriorly .... *Diancistrus pohnpeiensis* n. sp.

Diancistrus alatus n. sp.

(Figs 7, 8, 29; Table 5)

Material examined. (1 specimen, 32 mm SL). Holotype – USNM 372953, male, 32 mm SL, 19°16'S, 174°22'W, small reefs between Ha'apai and Vava'u Island groups, Tonga, caves and surge channels into reef front, rubble at base of reef, 2–7 m, J. T. Williams *et al.*, 10 Nov. 1993.

Diagnosis. Body slender, small; vertebrae 11+31 = 42, dorsal fin rays 79, anal fin rays 59; outer pseudoclasper large, wing-shaped, bent outwards, with flat, broad supporter; inner pseudoclasper free, broad-based, bifurcate, its anterior branch twice as long as posterior branch extending over anterior part of outer pseudoclasper, both with rounded tip; scale patch only on cheek, no scales on operculum; otolith length to sulcus length 2.2.

Description. The principal meristic and morphometric characters are shown in Table 5. Body and head profile slender, fish small, mature at 32 mm SL. Head with narrow scale patch on cheek containing up to 4 vertical rows of small scales. Horizontal diameter of scales on body about

Table 5. Meristic and morphometric characters of *Diancistrus alatus* n. sp.

	Holotype USNM 372953
Standard length in mm	32
Meristic characters	
Dorsal fin rays	79
Anal fin rays	59
Pectoral fin rays	20
Precaudal vertebrae	11
Caudal vertebrae	31
Total vertebrae	42
Rakers on anterior gill arch	17
Pseudobranchial filaments	-
D/V	6
D/A	19
V/A	13
Morphometric characters in % of SL	
Head length	27.2
Head width	9.4
Head height	17.2
Upper jaw length	12.8
Maxillary height	-
Diameter of pigmented eye	2.5
Interorbital width	4.1
Postorbital length	18.1
Preanal length	49.4
Predorsal length	32.8
Body depth at origin of anal fin	15.0
Pectoral fin length	14.4
Pelvic fin length	23.8
Base pelvic fin - anal fin origin	28.8

1.7% SL. Maxillaries expanded posteriorly with prominent angle at rear ventral corner and knob in front of rear angle. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril small, the size of anterior nostril and about 1/5 the size of eye.

Head sensory pores (Fig. 8 A–B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 4 rows of granular teeth and 1 row of larger teeth at symphysis, followed by about 4 rows of granular teeth posteriorly. Vomer horseshoe-shaped, with 1 tooth row, the posterior teeth the larger. Palatine teeth in 1 row with about 10 teeth. Dentary with 3 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, blending into 1 row of 8 fangs posteriorly, fang length up to about 1/3 of pupil diameter.

Otolith (Fig. 8 F–G). Moderately elongate, length to height 2.0 (32 mm SL); otolith length to sulcus length 2.2; sulcus inclined at an angle of 5°. Anterior tip of otolith pointed; posterior tip less pointed; dorsal rim with moderate concavities anteriorly and posteriorly.

Axial skeleton (of holotype). Neural spine of vertebrae 4 inclined and 5–8 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 8 C–E). Two pairs of large pseudoclaspers. Outer pseudoclasper large, wing-shaped, bent outwards, extending well outside even in resting position; its supporter flat, broad; inner pseudoclasper free, broad-based, bifurcate, its anterior branch twice as long as posterior branch extending over anterior part of outer pseudoclasper, both with rounded tip. Isthmus between pseudoclaspers narrow. Penis long, curved, uniformly thin.

Coloration. Live colour unknown. Uniformly light grey-brown when preserved.

Comparison. *Diancistrus alatus* belongs to the group of species with wing-shaped outer pseudoclaspers and bifurcate inner pseudoclaspers, which further contains

Fig. 7. *Diancistrus alatus* n. sp. Holotype. USNM 372953, male, 32 mm SL.

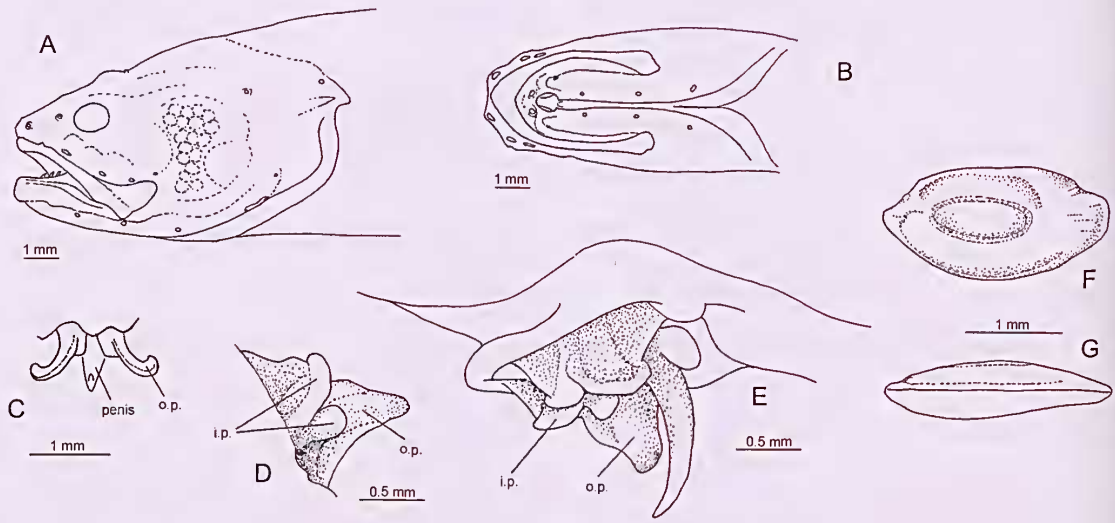

Fig. 8. *Diancistrus alatus* n. sp. Holotype. USNM 372953. **A**, lateral view of head; **B**, ventral view of head; **C**, ventral view of male copulatory organ; **D**, view of left pseudoclasper from inside; **E**, inclined lateral view of male copulatory organ; **F**, median view of right otolith; **G**, ventral view of right otolith.

the species *D. brevirostris* n. sp., *D. fijiensis* n. sp. and *D. jackrandalli* n. sp. *Diancistrus alatus* is distinguished from all of them in the anterior branch of the inner pseudoclasper being longer than the posterior branch. From *D. jackrandalli* n. sp. it is further distinguished by the higher number of vertebrae (42 or more versus 41 or less), the larger eye (>2.0% SL versus <2.0% SL) and the absence of scales on the operculum above the opercular spine (versus present). Compared to *D. brevirostris* n. sp. and *D. fijiensis* n. sp., *D. alatus* usually has a lower number of vertebrae (42 versus 42–45). In *D. fijiensis* n. sp. the sulcus on the otolith is more anteriorly positioned than in *D. alatus* and with the dorsal rim of the otolith very gently curved without distinct angles or concavities.

In Tonga, *Diancistrus tongaensis* n. sp. and *D. manciporus* n. sp. occur in addition to *D. alatus*. *Diancistrus tongaensis* n. sp. belongs to the species group with ear-lobe shaped outer pseudoclaspers and small eyes and thus is readily distinguished. *Diancistrus manciporus* n. sp. belongs to the species group with hook shaped outer pseudoclaspers and is the only species of the genus lacking a upper preopercular pore.

Diancistrus alatus probably represents the species with the largest pseudoclaspers (in comparison with the size of the fish) within the genus (extrudes extensively from below the fleshy hood in the resting position).

Distribution (Fig. 29). Known from the holotype caught off the northern Tonga Islands.

Etymology. *Alatus* (Latin = winged), referring to the unusually large, protruding wing-shaped outer pseudoclaspers.

Diancistrus alleni n. sp.

(Figs 9–12; Table 6)

Material examined. (102 specimens, 29–70 mm SL). HOLOTYPE – AMS I. 19108-140, male, 52 mm SL, 14°40'S, 145°28'E, Lizard Island, Queensland, Great Barrier Reef, 1–10 m, D.F. Hoese and party, 17 Nov. 1975. PARATYPES – AMS IA.7–91, 1 female, 62 mm SL, 16°37'S, 168°09'E, Vanuatu, Epi Island, A.R. McCulloch and party; AMS I. 18469-162, 1 embryo-bearing female, 44 mm SL and 1 female, 46 mm 03°01'S, 128°03'E, Ceram, Maluku, Indonesia, J.R. Paxton, 1 April 1975; AMS I. 18739-037, 4 males, 43–61 mm SL and 2 females, 47–50 mm SL, 14°42'S, 145°27'E, Lizard Island, Great Barrier Reef, J.R. Paxton and party, 21 Nov. 1975; AMS I. 19108-141, 1 female, 47 mm SL, same data as holotype; AMS I. 20779-232, 1 male, 45 mm SL, 13°05'S, 143°57'E, Cape York, N end of Tijou Reef, Great Barrier Reef, AMS and AIMS team, 22 Feb. 1979; AMS I. 22581-025, 2 males, 54–56 mm SL, 15°49'S, 145°50'E, Escape Reef, back reef slope, Great Barrier Reef, Queensland, 10–14 m depth, AMS party, 29 Oct. 1981; AMS I. 22582-078, 1 female, 54 mm SL, 15°49'S, 145°50'E, Escape Reef, outer barrier reef, Great Barrier Reef, 14–17 m depth, AMS party, 29 Oct. 1981; AMS I. 33693-007, 1 male, 51 mm SL, 11°42'S, 144°04'E, Great Barrier Reef, 11 Jan. 1993; BPBM 17545, 2 females, 37–39 mm SL, Tutuila Island, American Samoa, J.E. Randall, R.C. Wass and McGuire, 11 May 1974; BPBM 24123, 1 male, 58 mm SL and 1 female, 59 mm SL, Tutuila Island, American Samoa, R.C. Wass, 1976–77; CAS 222743, 1 male, 70 mm SL, Bagabag Island, Papua New Guinea, S.G. Poss, D.G. Catania and party, 18 May 1987; NSMT P. 49905, 1 female, 51 mm SL, Meno Island, Lombok Strait, Indonesia, K. Matsuura, 24 July 1996; ROM 42713, 2 females, 36–51 mm SL, 09°S, 159°E, Chagos Archipelago, R. Winterbottom, Oct. 1983; ROM 78114, 1 male, 49 mm SL and 1 female, 34 mm SL, 05°S, 071°E, Chagos Archipelago; USNM 209549, 3 females, 36–53 mm SL, Haruku Island, point east of Tandjung Naira, 5 m depth, Maluku Province, Indonesia, V.G. Springer and M.F. Gomon, 15 Jan. 1973; USNM 222482, 1 male, 65 mm SL, Tutuila Island, American Samoa, R. C. Wass; USNM 247276, 3 males, 43–48 mm SL and 2 females, 45 mm SL, 05°21'S, 072°12'E, Salomon Atoll, Chagos Archipelago, A.R. Emery *et al.*, 14 March 1979; USNM 362752, 13°52'S, 167°33'E, 1 male, 49 mm SL and 2 females, 47–51 mm SL, Vanua Lava, Banks Islands, Vanuatu, J.T. Williams *et al.*, 16 May 1997; USNM 366509, 1 female, 42 mm SL,

Table 6. Meristic and morphometric characters of *Diancistrus alleni* n. sp.

	Holotype AMS I. 19108-140	Holotype + 64 paratypes	N
		Mean (range)	
Standard length in mm	52	47.3 (38-70)	64*
Meristic characters			
Dorsal fin rays	81	79.1 (75-84)	39
Anal fin rays	66	64.5 (60-70)	40
Pectoral fin rays	19	18.9 (18-20)	31
Precaudal vertebrae	11	11	42
Caudal vertebrae	33	32.9 (31-35)	40
Total vertebrae	44	43.9 (42-45)	40
Rakers on anterior gill arch	16	15.4 (13-18)	41
Pseudobranchial filaments	2	2	41
D/V	7	6.4 (6-7)	39
D/A	20	19.6 (16-23)	39
V/A	14	13.2 (12-14)	39
Morphometric characters in % of SL			
Head length	25.8	27.2 (25.1-29.1)	41
Head width	11.0	13.1 (11.0-16.1)	37
Head height	19.2	18.8 (15.9-22.0)	38
Upper jaw length	11.2	13.2 (11.2-14.7)	41
Maxillary height	4.6	4.6 (3.8-5.4)	40
Diameter of pigmented eye	2.5	2.8 (2.4-3.5)	41
Interorbital width	5.6	5.5 (3.6-7.6)	38
Postorbital length	17.3	19.5 (17.3-23.1)	39
Preanal length	47.5	48.1 (43.1-56.6)	41
Predorsal length	31.9	33.4 (28.9-35.9)	40
Body depth at origin of anal fin	18.3	18.4 (16.6-20.9)	41
Pectoral fin length	17.5	16.2 (13.7-19.7)	34
Pelvic fin length	20.6	23.3 (17.8-27.7)	32
Base pelvic fin - anal fin origin	30.4	26.5 (20.3-31.1)	40

* One paratype with broken tail.

07°15'S, 072°22'E, Chagos Archipelago; USNM 384597, 4 males, 33–52 mm SL and 2 females, 33–52 mm SL, 05°52'S, 110°25'E, Karimundjawa Archipelago, Java Sea, Indonesia, V.G. Springer *et al.*, 29 March 1974; WAM P. 27469-009, 1 male, 48 mm SL, 15°50'S, 145°50'E, Queensland, Great Barrier Reef, Escape Reef, G.R. Allen *et al.*, 31 Oct. 1981; WAM P. 28554-003, 3 females, 44–59 mm SL, Chagos Archipelago; WAM P. 30340-010, 1 male, 60 mm SL and 1 female, 45 mm SL, 05°11'S, 145°50'E, Madang, Papua New Guinea, G.R. Allen, 1991; WAM P. 30844-049, 1 male, 29 mm SL, 11°58'S, 123°21'E, Hibernia Reef, Timor Sea, G.R. Allen, 19 Sept. 1994; WAM P. 31144-024, 2 females, 33–49 mm SL, 05°18'S, 150°08'E, Kimbe Bay, Bismarck Archipelago, G.R. Allen, 20 April 1996; WAM P. 31202-002, 1 male, 50 mm SL and 1 female, 34 mm SL, 14°15'S, 125°18'E, Bonaparte Archipelago, East Montalivet Island, Western Australia, G.R. Allen, 24 Sept. 1996; WAM P. 31437-037, 1 male, 58 mm SL and 1 female, 52 mm SL, 12°15'S, 122°58'E, Timor Sea, Ashmore Reef, Western Australia, J.B. Hutchins, 1 Oct. 1997; WAM P. 31438-083, 1 male, 45 mm SL and 2 females, 30–54 mm SL, 12°15'S, 122°58'E, Ashmore Reef, Timor Sea, Western Australia, J.B. Hutchins, 3 Oct. 1997; WAM P. 31654-002, 1 male, 51 mm SL and 1 female, 51 mm SL, 14°07'S, 125°16'E, Bonaparte Archipelago, Ingram Shoals, Western Australia, G.R. Allen, 20 Sept. 1998; ZMUC P 771486, 1 female, 52 mm SL, same data as WAM P. 28554-003; ZMUC P 771487, 1 male, 45 mm SL, same data as WAM P. 30844-049.

Additional specimens. AMS I. 17094-070, 2 males, 08°S, 151°E; AMS I. 17472-056, 1 female, 56 mm SL, Vanuatu; AMS I. 19456-036, 1 male, 45 mm SL, Queensland, Great Barrier Reef, Lizard Island; AMS I. 22586-009, 1 male, 60 mm SL and 3 females, 39–45 mm SL, Queensland, Great Barrier Reef, Escape Reef; AMS I. 22611-017, 2 males, 29–51 mm SL, Queensland, Great Barrier Reef, Escape Reef; USNM 263685, 3 males and 10 females, 30–68 mm SL, 01°33'S, 144°59'E, Papua New Guinea; USNM 263747, 7 males, 38–64 mm SL, Solomon Islands, Bougainville Island; USNM 356170, 1 male, 44 mm SL, 17°03'S, 168°21'E, Vanuatu, Emae Island; USNM 376192, 3 females, 51–53 mm SL, 05°52'S, 110°25'E, Karimundjawa Archipelago, Java Sea, Indonesia, V.G. Springer and party, 29 March 1974; USNM BBC 1488-90, 1 male and 1 female, 40–58 mm SL, Papua New Guinea, Madang.

Tentatively assigned specimens. BPBM 33057, 1 female, 45 mm SL, North Malé Atoll, Maldive Islands, J.E. Randall, R.C. Anderson, Adam and Shareef, 24 March 1988.

Diagnosis. Vertebrae 11+32–34=43–45, dorsal fin rays 75–84, anal fin rays 60–70; outer pseudoclasper hook-shaped, hook-like extension bent outwards, with massive supporter; inner pseudoclasper anteriorly connected to outer pseudoclasper, stout, fleshy; 1 or 2, rarely 3 large scales on operculum above opercular spine aligned in single row and usually covered by mucus and skin.

Description. The principal meristic and morphometric characters are shown in Table 6. Body compact with blunt, fleshy snout; fishes mature at about 40 to 45 mm SL. Head with narrow scale patch on cheek containing up to 4 or 5 vertical rows of small scales on upper half; 1 or 2, rarely 3 large scales on operculum above opercular spine aligned in single row and usually covered by mucus and skin. Horizontal diameter of scales on body about 1.9% SL. Maxillaries expanded posteriorly with prominent knob at rear ventral corner. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril small, the size of anterior nostril and about 1/5 the size of eye.

Head sensory pores (Fig. 10 A–C). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 4 rows of granular teeth and 1 row of larger teeth at symphysis, followed by about 5 rows of granular teeth posteriorly. Largest teeth anteriorly about ½ pupil diameter. Vomer horseshoe-shaped, with 2 tooth rows, with the larger teeth posteriorly on inner row. Palatine with 2 tooth rows, with teeth on inner row slightly larger than on outer row. Dentary with 3 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, blending into 1 row of 6 very large fangs posteriorly, fang length up to about 1/1 of pupil diameter.

Otolith (Fig. 10 H). Moderately elongate, length to height 1.9–2.0 (40–60 mm SL); otolith length to sulcus length 2.1–2.2; sulcus inclined at an angle of 5°. Anterior tip of otolith pointed; posterior tip abrupt.

Fig. 9. *Diancistrus alleni* n. sp. Holotype. AMS I. 19108-140, male, 52 mm SL.

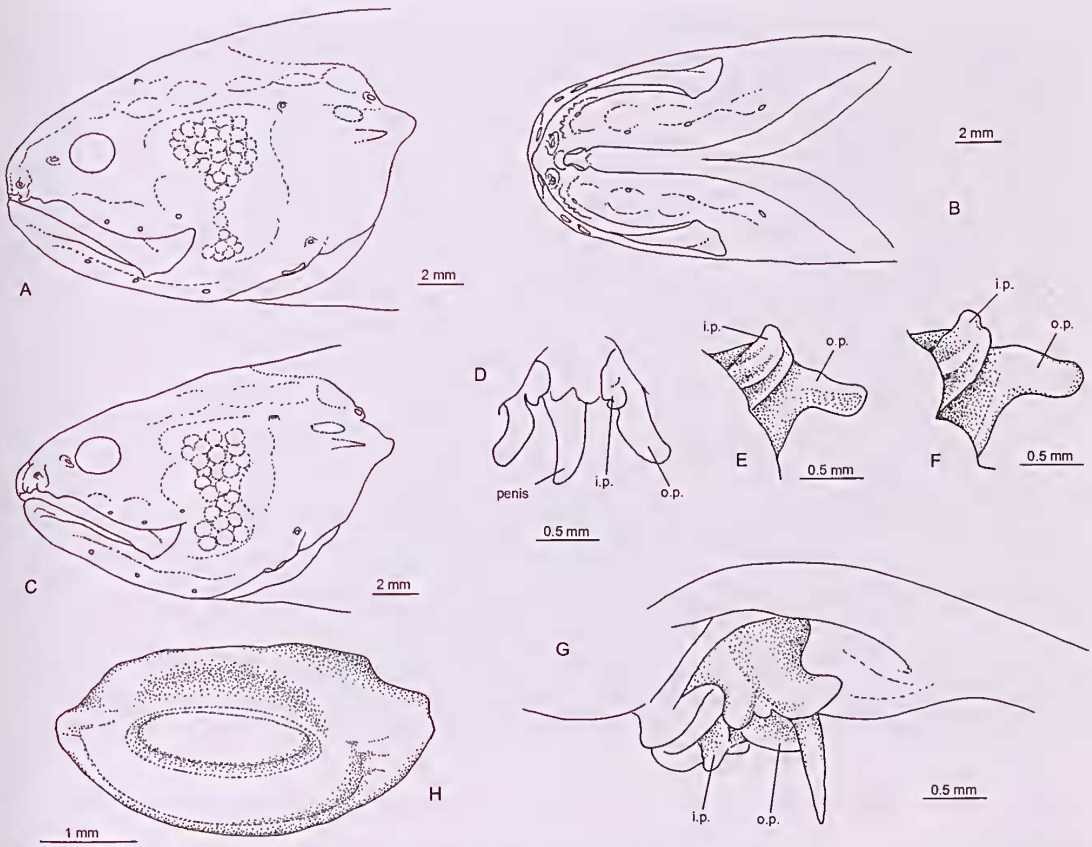

Fig. 10. *Diancistrus alleni* n. sp. **A**, lateral view of head, AMS I. 18739-037, male, 61 mm SL; **B**, ventral view of head, AMS I. 18739-037, male, 61 mm SL; **C**, lateral view of head, USNM 384597, female, 53 mm SL; **D**, ventral view of male copulatory organ, WAM P. 31438-083, 43 mm SL; **E**, view of left pseudoclasper from inside, USNM 362752, 50 mm SL; **F**, view of left pseudoclasper from inside, USNM 247276, 48 mm SL; **G**, inclined lateral view of male copulatory organ, USNM 362752, 50 mm SL; **H**, median view of right otolith, WAM P. 30844-049, male, 45 mm SL.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–9 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10 (11). First anal fin pterygiophore elongated, close to but not reaching tip of last precaudal parapophysis in males and shorter in females.

Male copulatory organ (Fig. 10 D–G). Two pairs of large pseudoclaspers. Outer pseudoclasper large, hook-shaped, its tip bent outwards, with massive supporter; inner pseudoclasper anteriorly connected to outer pseudoclasper, stout, fleshy. Isthmus between pseudoclaspers moderately wide. Penis long, curved, thin.

Coloration. Live colour unknown. Uniformly light to medium brown when preserved.

Comparison. *Diancistrus alleni* belongs to the group of species with hook- or stick-shaped outer pseudoclaspers, which further contains the species *D. beateae* n. sp., *D. fuscus*, *D. leisi* n. sp., *D. longifilis*, *D. machidai* n. sp., *D. manciporus* n. sp., *D. novaeguineae*, *D. springeri* n. sp. and *D. vietnamensis* n. sp. Of these, *D. beateae* n. sp. is readily distinguished by the complete scale coverage on the operculum, whereas *D. leisi* n. sp., *D. longifilis* and *D. manciporus* n. sp. lack scales on the operculum. *Diancistrus alleni* is distinguished from *D. longifilis*, with which it may overlap in distribution along the southern reaches of the Great Barrier Reef, and *D. manciporus* n. sp. by the inner pseudoclasper being thick, stout and fleshy versus wide and thin and concave in shape towards the isthmus. This is important to notice, since from New Caledonia two undisputable male specimens of *D. longifilis* have been studied, which were bearing a single scale above the opercular spine just like in *D. alleni*.

Fig. 11. *Diancistrus alleni* n. sp. Embryo 5 mm TL from AMS I. 18469-162, 44 mm SL.

Fig. 12. Sample sites of *Diancistrus alleni* n. sp., *D. longifilis*, *D. manciporus* n. sp. and *Diancistrus* sp. 1. One symbol may represent several samples.

Similar observations have been made on *D. machidai* n. sp., which also has specimens without, or with only 1 or 2 scales, above the opercular spine. *Diancistrus alleni* is distinguished from *D. machidai* n. sp. by the higher number of dorsal fin rays (75–84 versus 66–77), the higher number of vertebrae (43–45 versus 40–43), the outer pseudoclasper with a hook-like extension bent outwards (versus straight) and the inner pseudoclasper being stout and fleshy (versus narrow and pointed). *Diancistrus alleni* differs from *D. leisi* n. sp. and *D. springeri* n. sp. in the latter having a straight, stick-like outer pseudoclasper. *Diancistrus alleni* differs from *D. novaeguineae* in having 1–3 scales above the opercular spine (versus large scale patch above the opercular spine containing 6 to 11 scales) and the pseudoclasper pattern composed of an outer pseudoclasper with a hook-like extension bent outwards (versus blunt hook-shaped) and the inner pseudoclasper being stout and fleshy (versus wide with a little lobe anteriorly and an extended flap posteriorly). The closest species to *D. alleni* are *D. fuscus* and *D. vietnamensis* n. sp., which share the same pseudoclasper pattern, but it differs from both in the smaller number of scales above the opercular spine (1–2, rarely 3 versus 3–7), although there seems to be a marginal overlap. From *D. vietnamensis* n. sp. it further differs in the low neck (versus high) and the usually higher number of dorsal fin rays (75–84 versus 69–80). Also in geographical distribution *D. alleni* (chiefly south of the Equator) seems to be disjunct in distribution from *D. fuscus* (northern Philippines and Ryukyus) and *D. vietnamensis* n. sp. (northern Vietnam and Hainan Island).

Biology. A 44 mm SL female (AMS I. 18469-162) contains embryos, 4–5 mm TL, with a few pigment spots above the vent and three short rows of pigment spots posteriorly on the body (Fig. 11).

Distribution (Fig. 12). *Diancistrus alleni* is one of the most common and widespread species of the genus. Its distribution ranges from the Chagos and Maldive Archipelagos, where it represents the western-most occurrence of the genus, to Java, along the northern Australian coast from 14°S, 125°E southwards to the central Great Barrier Reef at 15°S, 145°E, and east to New Guinea, Solomon Islands, Vanuatu and Samoa. The occurrence in the Chagos and Maldives appears to be disjunct from the other occurrences, but neither pseudoclaspers, head squamation, meristics or any other character investigated indicate morphological differences. In the east, *D. alleni* occurs commonly associated with *D. novaeguineae* and, occasionally, *D. machidai* n. sp.

Ecology. The species was found in coral reef habitats at 5–17 m depth.

Etymology. Named in honour of Gerald R. Allen, Perth, Western Australia, in recognition of his many contributions to the ichthyology of the West Pacific.

Diancistrus altidorsalis n. sp.

(Figs 13, 14, 20; Table 7)

Material examined. (88 specimens, 23–102 mm SL). HOLOTYPE – WAM P. 30410-001, male, 66 mm SL, 04°35'N, 118°45'E, Malaysia, Sabah, Bodgaya Island, sand and coral bottom at 15–20 m, G.R. Allen, 1992. PARATYPES – BPBM 40210, 1 female, 43 mm SL, 01°N, 124°E, Manado, Bunaken, Sulawesi, Indonesia, J.E. Randall, Severns and R.C. Pyle, 29 Oct. 1991; USNM 263697, 1 male, 63 mm SL, 2 females, 55–67 mm SL and 1 juvenile, 26 mm SL, 00°49'S, 130°56'E, Batanta Island, Papua, Indonesia, B.B. Collette *et al.*, 2 July 1979; USNM 263701, 2 males, 49–62 mm SL and 3 females, 23–39 mm SL, 05°17'S, 122°04'E, Kabaena Island, SE Sulawesi, Indonesia V.G. Springer, 24 Feb. 1974; USNM 263703, 2 males and 1 female, 52–86 mm SL, 05°52'S, 110°24'E, Karimundjawa Archipelago, Java Sea, Indonesia; USNM 263705, 9 males, 47–70 mm SL and 13 females, 60–85 mm SL, 05°51'S, 106°35'E; Seribu Islands, Java Sea, Indonesia, V.G. Springer *et al.*, 5 April 1974; USNM 374157, 1 male, 46 mm SL, 10°42'S, 165°50'E, Ndendo Island, Graciosa Bay, Santa Cruz Islands, Solomon Islands, J. T. Williams *et al.*, 26 Sept. 1998; WAM P. 31213-007, 1 male, 63 mm SL, 05°10'S, 145°49'E, Madang, lagoon, Papua New Guinea, G.R. Allen and A. Jenkins, 21 Oct. 1996; WAM P. 31355-026, 1 male, 61 mm SL and 2 females, 63–79 mm SL, 10°46'S, 151°42'E, Irai Island, Conflict Group, Papua New Guinea, G.R. Allen, 1 Oct. 1997; WAM P. 31491-001, 1 male, 91 mm SL and 3 females, 38–95 mm SL, 00°29'S, 122°04'E, Togean Islands, Sulawesi, Indonesia, G.R. Allen, 31 Oct. 1998; WAM P. 31736-004, 1 female, 35 mm SL, 11°15'S, 152°08'E, Panarairai, Louisiade Islands, Papua New Guinea, G.R. Allen, 22 June 2000; ZMUC P 771372-3, 1 male, 93 mm SL and 1 female, 61 mm SL, Bali, Indonesia (aquarium fish); ZMUC P 771450, 1 male, 69 mm SL, Bali, Indonesia (aquarium fish); ZMUC P 771457-8, 1 male, 75 mm SL and 1 female, 66 mm SL, Bali, Indonesia (aquarium fish); ZMUC P 771464-65, 1 male, 68 mm SL, 1 female, 59 mm SL, Bali, Indonesia (aquarium fish).

Additional specimens. AMS I. 39013-013, 1 female, 67 mm SL, Santa Cruz Islands, Solomon Islands; AMS I. 39029-003, 1 male, 78 mm SL and 1 female, 54 mm SL, 09°47'S, 167°05'E, Santa Cruz Islands, Solomon Islands; USNM 99173, 1 male, 81 mm SL, Tomahu Island, Maluku, Indonesia; USNM 263684, 3 males and 8 females, 33–102 mm SL, 01°14'S, 144°22'E, Ami Island, Papua New Guinea; USNM 263706, 1 male, 67 mm SL, 01°33'S, 144°59'E, Papua New Guinea; USNM 376189, 1 male, 84 mm SL, 05°52'S, 11°25'E, Karimundjawa Archipelago, Java Sea, Indonesia; USNM 376215, 4 males and 14 female, 32–65 mm SL, Madang, Papua New Guinea.

Table 7. Meristic and morphometric characters of *Diancistrus altidorsalis* n. sp.

	Holotype WAM P. 30410-001	Holotype + 40 paratypes	N
		Mean (range)	
Standard length in mm	66	58.8 (23-95)	41
Meristic characters			
Dorsal fin rays	77	79.9 (76-85)	29
Anal fin rays	61	64.2 (59-68)	29
Pectoral fin rays	18	17.7 (17-19)	27
Precaudal vertebrae	11	11	31
Caudal vertebrae	32	32.6 (32-34)	31
Total vertebrae	43	43.6 (43-45)	31
Rakers on anterior gill arch	14	15.9 (14-18)	30
Pseudobranchial filaments	2	2	29
D/V	6	6.4 (6-7)	29
D/A	19	19.6 (18-22)	29
V/A	13	13.1 (12-14)	29
Morphometric characters in % of SL			
Head length	27.1	27.7 (25.3-29.0)	30
Head width	16.1	15.1 (12.6-18.1)	30
Head height	18.5	18.6 (15.7-21.7)	30
Upper jaw length	14.0	13.9 (12.9-14.9)	29
Maxillary height	4.5	4.5 (3.6-5.1)	30
Diameter of pigmented eye	3.5	3.3 (2.7-4.3)	32
Interorbital width	6.7	6.8 (5.6-7.9)	28
Postorbital length	19.6	20.0 (18.2-21.5)	29
Preanal length	48.2	47.6 (44.4-50.7)	30
Predorsal length	34.8	34.8 (32.3-38.5)	30
Body depth at origin of anal fin	22.6	20.5 (16.5-23.2)	30
Pectoral fin length	17.2	17.0 (12.9-19.8)	29
Pelvic fin length	-	23.2 (20.6-25.6)	23
Base pelvic fin - anal fin origin	27.4	26.8 (22.2-30.9)	29

Diagnosis. Vertebrae 11+32–34=43–45, dorsal fin rays 76–85, anal fin rays 59–68; eyes large (≥2.5% SL); outer pseudoclasper large, broad, ear-lobe shaped; inner pseudoclasper a fleshy appendix at the anterior-inner rim of the outer pseudoclasper, without supporter; large scale patch on operculum above opercular spine (6–9 scales) and 1 to 3 isolated scales below opercular spine; head profile strongly 'high-necked / hump-backed'; life colour yellow.

Description. The principal meristic and morphometric characters are shown in Table 7. Body compact, high-necked, highest just in front of dorsal fin origin, snout slender, often somewhat pointed; fishes large, mature at about 50 to 55 mm SL. Head with broad scale patch on cheek, two separate scale patches on operculum, one large, above opercular spine, with 6 to 9 scales in 2 to 3 rows and 1 to 3 isolated scales below opercular spine. Horizontal diameter of scales on body about 1.9% SL. Maxillaries expanded posteriorly with prominent angle at rear ventral corner. Anterior nostril low on snout, 1/3 distance from tip of snout to anterior margin of eye. Posterior nostril small, the size of anterior nostril and about 1/7th to 1/10th the size of eye.

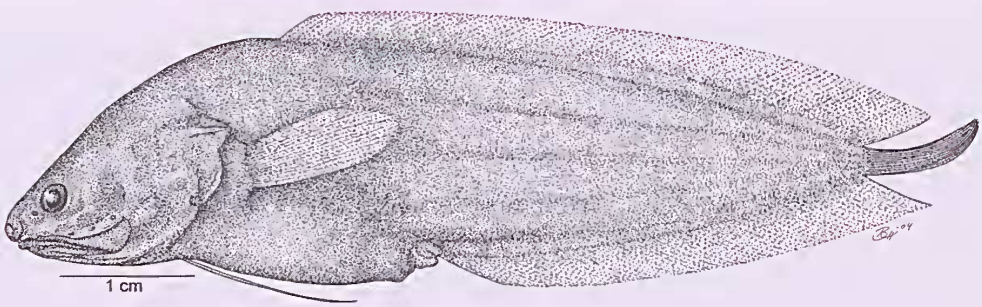

Fig. 13. *Diancistrus altidorsalis* n. sp. Holotype. WAM P. 30410-001, male, 66 mm SL.

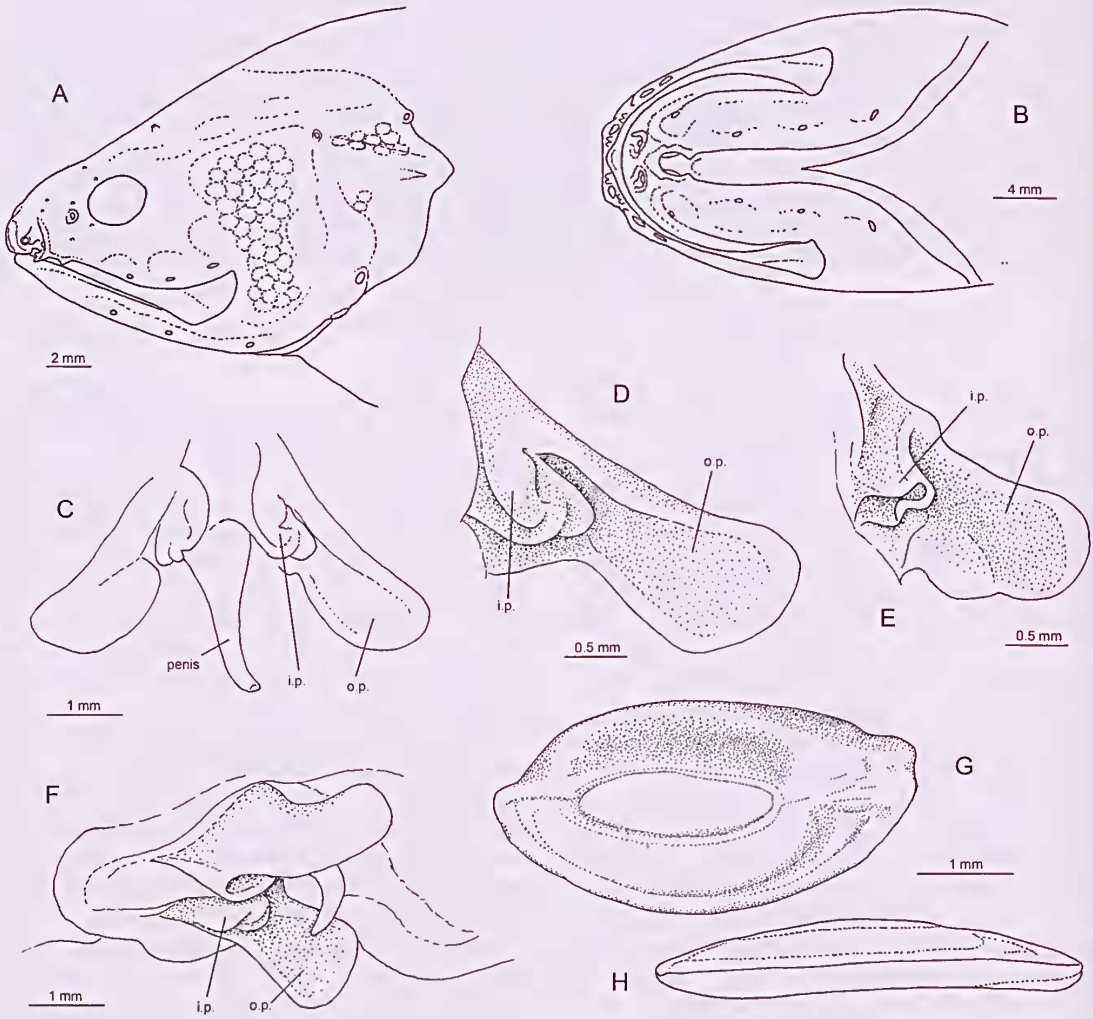

Fig. 14. *Diancistrus altidorsalis* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, ventral view of male copulatory organ, WAM P. 31491-001, 91 mm SL; **D**, view of left pseudoclasper from inside, WAM P. 31491-001, 91 mm SL; **E**, view of left pseudoclasper from inside, holotype; **F**, inclined lateral view of male copulatory organ, WAM P. 31491-001, 91 mm SL; **G**, median view of right otolith, holotype; **H**, ventral view of right otolith, holotype.

Head sensory pores (Fig. 14 A–B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 6 rows of granular teeth and 2 rows of larger teeth at symphysis, followed by about 9 rows of granular teeth posteriorly. Vomer horseshoe-shaped, with 3 rows of teeth, the posterior inner teeth enlarged. Palatine teeth in 3 rows, largest on inner row. Dentary with 4 outer rows of granular teeth and 2 inner rows of anteriorly larger teeth, blending into 1 row of 15 large fangs posteriorly, which are up to about 1/3 of pupil diameter.

Otolith (Fig. 14 G–H). Moderately elongate, length to height 1.9–2.0 (35–95 mm SL); otolith length to sulcus length 2.0–2.2; sulcus slightly inclined at an angle ≤5°. Anterior tip of otolith pointed; posterior tip broader; rims gently curved except sometimes an obtuse postdorsal angle.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–8 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, but not reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 14 C–F). Two pairs of large pseudoclaspers. Outer pseudoclasper large, broad, ear-lobe shaped, with a massive supporter; inner pseudoclasper a fleshy appendix of somewhat variable shape at anterior-inner rim of the outer pseudoclasper, atrophied without supporter. Isthmus between pseudoclaspers moderately wide. Penis long, curved, with broad base and sharp tip.

Coloration. Live colour bright yellow. Uniformly light brown when preserved.

Comparison. *Diancistrus altidorsalis* belongs to the group of species with ear-lobe shaped outer pseudoclaspers. It is easily distinguished from all other species of the group in being the only one with scales on the operculum. Together with *D. niger* n. sp., it is further distinguished by the large eye (>2.5% SL) from the *Diancistrus erythraeus* subgroup with small eyes (≤2.0% SL) comprising *D. atollorum* n. sp., *D. erythraeus, D. megroutheri* n. sp., *D. robustus* n. sp. and *D. tongaensis* n. sp. The small-eyed species always have a supporter in the inner pseudoclasper, which is lacking both in *D. altidorsalis* and *D. niger* n. sp. *Diancistrus niger* n. sp. is unique in the dark, almost black, colour in preservation. *Diancistrus altidorsalis* differs from *D. niger* n. sp. in the higher number of dorsal fin rays (76–85 versus 69–76), anal fin rays (59–68 versus 52–59) and the less elongate otolith (otolith length to height ratio 1.9–2.0 versus 2.2–2.3). *Diancistrus altidorsalis* further differs from the other specimens of the group by the high number of vertebrae (43 and more), shared only by *D. robustus* n. sp. Furthermore it seems to be the largest species in this group.

Diancistrus altidorsalis is a very characteristic species of the genus *Diancistrus* occurring over a large area and (partly) co-occurring with a variety of other species such as *D. alleni, D. beateae* n. sp., *D. karinae* n. sp., *D. machidai* n. sp., *D. novaeguineae* and *D. springeri* n. sp., all of which do not share the ear-lobe shaped outer pseudoclasper. *Diancistrus beateae* n. sp. and *D. karinae* n. sp. differ in the complete coverage of the operculum with scales above and below the opercular spine, whereas *D. alleni* and *D. machidai* n. sp. show only few scales (or none, as the case may be with *D. machidai* n. sp.) above the opercular spine. *Diancistrus springeri* n. sp. and *D. novaeguineae* come closest of those with a large scale patch above the opercular spine, but no scales below, except for a very few large specimens of *D. novaeguineae*, where even a few scales below the opercular spines can be present. In those rare instances distinction would largely depend on pseudoclaspers, but *D. altidorsalis* appears more high-necked than *D. novaeguineae*.

Biology. *Diancistrus altidorsalis* is one of the few species that has been observed alive (in the ZMUC aquarium). Several specimens were obtained from Bali by the Danish Aquarium in Charlottenlund under the name *"Brotulina fusca"*. Larger dominating specimens were observed to make attacks towards smaller specimens, which were hiding below rocks or any other shelter provided. Otherwise, the fishes swam actively forward and backward at similar ease with undulating movements of their vertical fins. One male was observed to flip the cover of the copulatory organ backward and forward so that the organ was exposed or covered while swimming.

Distribution (Fig. 20). *Diancistrus altidorsalis* is widespread and fairly common in the central part of the West Pacific. It is known from the Java, Bali and Sabah in the west to Sulawesi and New Guinea and reaches eastward to the Solomon Islands (including Santa Cruz Islands).

Etymology. Named after the characteristic high-necked profile – *altus* (Latin) = high, and *dorsalis* (Latin) = neck.

Diancistrus atollorum n. sp.

(Figs 15, 16, 17; Table 8)

Material examined. (26 specimens, 25–58 mm SL). Holotype – CAS 222744, male, 47 mm SL, Falalap Islet, Ifaluk Atoll, Yap State, Federated States of Micronesia, off outer reef at 1–4 m, Pakal, Tachim, Yarofoma and R.R. Rofen, 22 Oct. 1953. Paratypes – BPBM 15366, 1 male, tail broken, Onotoa Atoll, Gilbert Islands, Kiribati; CAS 81438, 1 male, 38 mm SL and 1 female, 46 mm SL, Kapingamarangi Atoll, Pohnpei State, Federated States of Micronesia, lagoon coral heads on inner margin of reef flat, Atta, Kindaro and R.R. Rofen, 14 July 1954; CAS 222745, 3 males, 39–47 mm SL and 3 females, 45–58 mm SL, same data as holotype; MCZ 158558, 1 male, 45 mm SL, 04°28'S, 172°10'W, Orona Atoll, Gilbert Islands, Kiribati, R.M. Bailey, 3 July 2000; USNM 263668, 1 male, 35 mm SL, Kwajalein Atoll, Marshall Islands, 1 Nov. 1964; USNM 372948, 2 males, 32 mm SL and 3 females, 25–33 mm SL, Rongerik Atoll,

Table 8. Meristic and morphometric characters of *Diancistrus atollorum* n. sp.

	Holotype CAS 222744	Holotype + 25 paratypes Mean (range)	n
Standard length in mm	47	41.1 (25-58)	25*
Meristic characters			
Dorsal fin rays	76	73.7 (72-76)	18
Anal fin rays	60	57.5 (56-61)	18
Pectoral fin rays	21	21.0 (20-22)	21
Precaudal vertebrae	11	10.9 (10-11)	19
Caudal vertebrae	30	29.7 (29-31)	18
Total vertebrae	41	40.7 (40-42)	18
Rakers on anterior gill arch	12	15.5 (12-18)	18
Pseudobranchial filaments	2	2	12
D/V	6	6.1 (6-7)	19
D/A	20	20.3 (17-22)	19
V/A	13	12.9 (12-14)	19
Morphometric characters in % of SL			
Head length	27.8	27.5 (25.7-29.4)	19
Head width	14.3	13.5 (10.7-16.6)	17
Head height	17.6	17.0 (15.7-19.0)	18
Upper jaw length	15.2	14.0 (12.9-15.5)	17
Maxillary height	4.5	4.3 (3.6-5.2)	19
Diameter of pigmented eye	1.8	1.7 (1.2-2.0)	21
Interorbital width	7.3	7.1 (6.2-8.4)	21
Postorbital length	20.6	20.8 (19.8-22.4)	18
Preanal length	49.1	48.1 (44.2-53.0)	20
Predorsal length	32.9	32.1 (29.4-34.8)	20
Body depth at origin of anal fin	18.6	18.5 (16.8-20.6)	21
Pectoral fin length	16.3	16.0 (13.3-17.3)	21
Pelvic fin length	28.4	27.2 (24.8-29.2)	14
Base pelvic fin - anal fin origin	28.3	27.4 (24.6-30.6)	20

*tail broken in one paratype

Marshall Islands, L.P. Schultz and E.S. Herald, 28 June 1946; USNM 372949, 1 male, 40 mm SL and 1 female, 40 mm SL, Rongelap Atoll, Marshall Islands, L.P. Schultz and E.S. Herald, 19 June 1946; USNM 372951, 1 male, 45 mm SL, Bikini Atoll, Marshall Islands, V.P. Brock *et al.*, 21 July 1947; USNM 372952, 1 male, 50 mm SL, Bikini Atoll, Marshall Islands, V.P. Brock and E.S. Herald, 7 Aug. 1946; USNM 372971, 1 male, 33 mm SL, Bikini Atoll, Marshall Islands, V.P. Brock and E.S. Herald, 7 Aug. 1946; USNM 376184, 2 females, 41–44 mm, Kwajalein Atoll, Marshall Islands, A.B. Amerson, 15 Oct. 1964; ZMUC P 771482, 1 male, 39 mm SL and ZMUC P 771483 1 female, 47 mm SL, same data as CAS 222745.

Diagnosis. Vertebrae 11+29–31=40–42, dorsal fin rays 72–76, anal fin rays 56–61; eyes small (≤2.0% SL); outer pseudoclasper deep, ear-lobe shaped, opened towards ventral; inner pseudoclasper firmly joined to outer pseudoclasper anteriorly, with supporter, forming a sharp, forward-inclined lobe; narrow scale patch on cheek, no scales on operculum; head profile slender; otolith length to height ratio >2.1.

Description. The principal meristic and morphometric characters are shown in Table 8. Body moderately compact, with slender fleshy snout; fishes mature at about 35 to 40 mm SL. Head with narrow scale patch on cheek, no scales on operculum. Horizontal diameter of body scales 2.0% SL. Maxillaries slightly expanded posteriorly with angle at rear ventral corner. Anterior nostril low on snout, 1/3 distance from tip of snout to anterior margin of eye. Posterior nostril small, the size of anterior nostril and about 1/4th the size of eye.

Head sensory pores (Fig. 16 A–B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 5 rows of granular teeth and 1 row of larger teeth at symphysis, followed by about 8 rows of granular teeth posteriorly. Anterior-most teeth on inner row the largest, about the size of pupil diameter. Vomer horseshoe-shaped, with 2 tooth rows of granular teeth. Palatine teeth in 2 rows, largest on inner row. Dentary with 5 outer rows of granular teeth and 1 inner row of larger teeth anteriorly. Totally, about 6 large teeth on inner row, about the size of pupil diameter.

Otolith (Fig. 16 F–G). Elongate with a much expanded slender posterior tip resulting in a length to height relation of 2.15 (40 mm SL); otolith length to sulcus length 2.3; sulcus not inclined. Anterior tip of otolith pointed; dorsal rim gently curved without angles.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–8 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, but not reaching tip of last preeaudal parapophysis.

Fig. 15. *Diancistrus atollorum* n. sp. Holotype. CAS 222744, male, 47 mm SL.

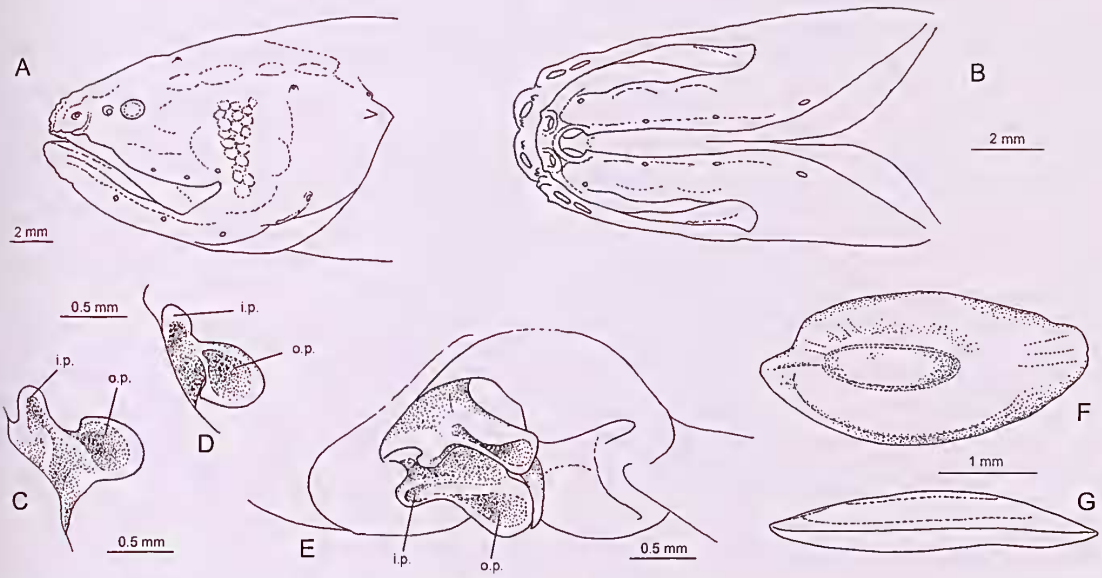

Fig. 16. *Diancistrus atollorum* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, view of left pseudoclasper from inside, holotype; **D**, view of left pseudoclasper from inside, CAS 222745, 47 mm SL; **E**, inclined lateral view of male copulatory organ, CAS 222745, 47 mm SL; **F**, median view of right otolith, MCZ 158558, male, 45 mm SL; **G**, ventral view of right otolith, MCZ 158558, male, 45 mm SL.

Male copulatory organ (Fig. 16 C–E). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper deep, ear-lobe shaped, opened towards ventral; inner pseudoclasper firmly joined to outer pseudoclasper anteriorly, with supporter, forming sharp, forward-inclined lobe. Isthmus between pseudoclaspers moderately wide. Penis short, curved, slender.

Coloration. Live colour. Uniformly light brown when preserved.

Comparison. *Diancistrus atollorum* belongs to the species group with ear-lobe shaped outer pseudoclaspers and small eyes (*Diancistrus erythraens* subgroup) further containing *D. erythraens, D. mcgroutheri* n. sp., *D. robustus* n. sp. and *D. tongaensis* n. sp. Except for

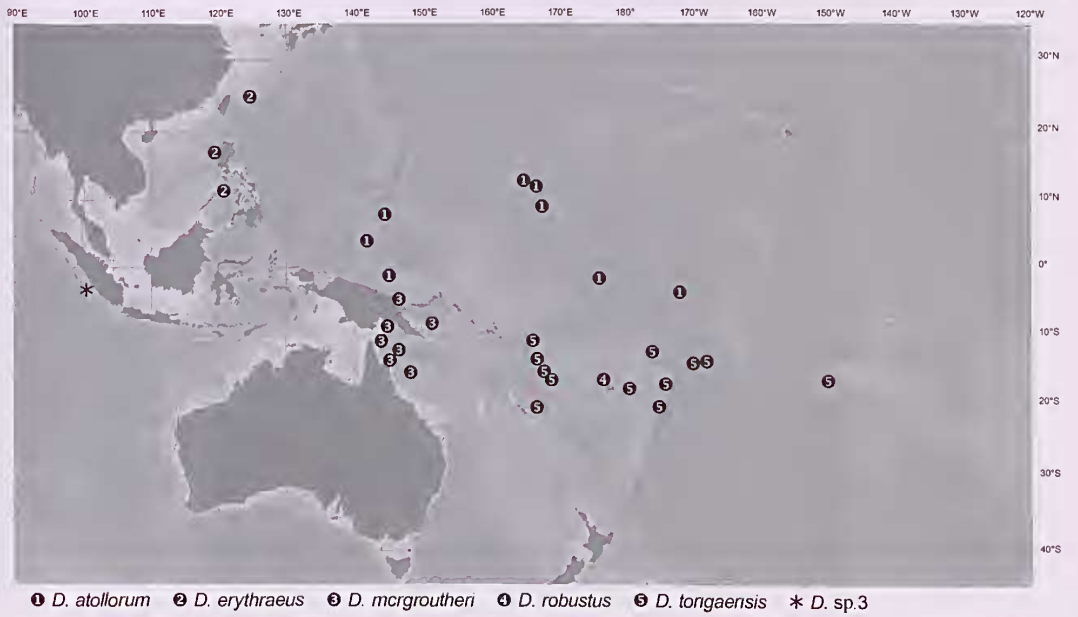

Fig. 17. Sample sites of *Diancistrus atollorum* n. sp., *D. erythraeus, D. mcgroutheri* n. sp., *D. robustus* n. sp., *D. tongaensis* n. sp. and *Diancistrus* sp. 3. One symbol may represent several samples.

D. robustus n. sp. the species of this subgroup are further characterized by the low number of vertebrae (39–41, rarely 42 versus 43 in *D. robustus* n. sp.) and the slender head (head width ≤16.5% SL versus >16.5% SL in *D. robustus* n. sp.). Of the remaining four species, *D. atollorum* is closest to *D. erythraeus*, being distinguished by the complete ear-lobe shaped outer pseudoclasper (versus incomplete, half-moon shaped), the large-lobed inner pseudoclasper (versus reduced, small, hook-like) and the more elongate otolith (otolith length to height >2.1 versus 2.0).

Diancistrus atollorum is the only small-eyed *Diancistrus* species and also the only one with ear-lobe shaped outer pseudoclaspers within its area of distribution. It does not seem to overlap with any other species of the group. It may occur locally with *D. beateae* n. sp., *D. meunei* n. sp., *D. eremitus* n. sp., *D. karinae* n. sp. or *D. pohnpeiensis* n. sp., all of which are readily distinguished not only by the pseudoclasper pattern, but also by the presence of scales on the operculum, the large eye (>2.5% SL versus ≤2.0% SL) and the higher number of vertebrae (generally 43 and more versus ≤42). Finally, these are all species growing to larger body sizes (up to 80 mm SL at least versus <60 mm SL).

Distribution (Fig. 17). *Diancistrus atollorum* is widespread and fairly common along the shores of the Micronesian atolls, from the Marshall Islands (Bikini, Rongelap, Rongerik, Kwajalein) in the north to Ifaluk and Kapingamarangi in the south and eastwards to Kiribati (Onotoa and Orona). To the north – Ryukyu Islands and northern Philippines – *D. atollorum* is replaced by *D. erythraeus,* to the south-east – Fiji, Tonga, Samoa – by *D. tongaensis* n. sp. and to the south-west – New Guinea, Vanuatu, Great Barrier Reef – by *D. mcgroutheri* n. sp.

Etymology. Named after its habitat among the Micronesian atolls.

Diancistrus beateae n. sp.

(Figs 18, 19, 20; Table 9)

Material examined. (50 specimens, 39–132 mm SL). HOLOTYPE – CAS 222746, male, 87 mm SL, 01°N, 154°E, Kapingamarangi Atoll, Pohnpei State, Micronesia, lagoon coral heads on inner margin of reef flat, Atta, Kindaro and R.R. Rofen, 14 July 1954. PARATYPES –AMS I. 20641-001, 1 female, 43 mm SL, 11°N, 166°E, Rongelap Island, Marshall Islands, V.P. Brock and party, 25 July 1946; AMS I. 20779-034, 1 female, 99 mm SL, 13°05'S, 143°57'E, Cape York, north end of Tijou Reef, Great Barrier Reef, 25 m depth, AMS and AIMS party, 22 Feb. 1979; AMS I. 33731-069, 1 male, 71 mm SL, 10°13'S, 144°24'E, Ashmore Reef, Coral Sea, 22 Jan. 1993; ANSP 135375, 1 male, 89 mm SL, 14°35'S, 145°36'E, Yonge Reef, Great Barrier Reef, 26 Nov. 1975; BPBM 13660, 1 female, 132 mm SL, Pixi Reef off Cairns, Great Barrier Reef, G.R. Allen, 2 July 1972; BPBM 40211, 1 female, 76 mm SL, Tutuila Island, American Samoa, R.C. Wass, 1976–77; USNM 222481, 1 male, 73 mm SL, Tutuila Bay, American Samoa, R.C. Wass; USNM 263664, 1 male, 95 mm SL, 16°45'S, 179°07'E, Wailangilala Island, Fiji, R. Bolin *et al.*, 26 May 1965; USNM 366841, 1 male, 58 mm SL and 1 female, 60 mm SL, 18°58'S, 179°52',W, Totoya Island, Fiji, K. Bruwelheide *et al.*, 27 April 1982; USNM 372950, 1 female, 45 mm SL, 01°33'S, 144°59'E, Hermit Island, Papua New Guinea, V.G. Springer *et al.*, 30 Oct. 1978; USNM 372959, 1 male, 75 mm SL, Kiriwina Island, Trobriand Islands, Papua New Guinea, T. Roberts, 19 Sept. 1975; USNM 372961, 2 males, 60–80 mm SL, 2 females, 59–68 mm SL and 2 juveniles, 46–53 mm SL, 01°33'S, 144°59'E, Hermit Island, Papua New Guinea, V.G. Springer *et al.*, 30 Oct. 1978; USNM 372963, 2 males, 59–72 mm SL, 18°58'S, 179°52'W, Totoya Island, Fiji, V.G. Springer *et al.*, 27 April 1982; USNM 372964, 1 female, 123 mm SL, 13°38'S, 167°30'E, Banks Islands, Vanuatu, J. T. Williams and R. Mooi, 20 May 1997; USNM 372965, 2 males, 52–72 mm SL and 1 female, 77 mm SL, 01°31'S, 145°01'E, Hermit Island, Papua New Guinea, V.G. Springer *et al.*, 1 Nov. 1978; USNM 372967, 2 males, 88–96 mm SL and 1 female, 87 mm SL, 18°52'S, 178°30'E, Vuro Island, Fiji, R. Bolin *et al.*, 8 May 1965; USNM 372968, 5 females, 41–112 mm SL, 17°44'S, 177°17'E, Malamala Island, Fiji, V.G. Springer

Table 9. Meristic and morphometric characters of *Diancistrus beateae* n. sp.

	Holotype CAS 222746	Holotype + 42 paratypes	n
		Mean (range)	
Standard length in mm	87	73.0 (39-132)	43
Meristic characters			
Dorsal fin rays	84	86.7 (84-91)	40
Anal fin rays	67	70.3 (65-74)	40
Pectoral fin rays	20	19.8 (19-21)	20
Precaudal vertebrae	11	11	40
Total vertebrae	46	45.0 (44-46)	40
Rakers on anterior gill arch	16	16.1 (14-19)	31
Pseudobranchial filaments	2	2	30
D/V)	6	6.0 (5-7)	40
D/A	20	21.5 (19-24)	40
V/A	13	13.0 (12-14)	40
Morphometric characters in % of SL			
Head length	29.3	28.7 (26.8-30.3)	31
Head width	13.9	14.5 (12.0-18.1)	31
Head height	21.6	23.0 (18.6-27.3)	31
Upper jaw length	14.0	14.2 (12.8-15.1)	31
Maxillary height	5.4	5.4 (4.6-6.0)	31
Diameter of pigmented eye	3.1	3.0 (2.6-3.5)	31
Interorbital width	6.4	6.3 (5.0-7.2)	31
Postorbital length	21.3	20.7 (19.2-22.2)	31
Preanal length	47.1	47.8 (44.3-52.5)	31
Predorsal length	34.6	34.7 (32.1-37.9)	31
Body depth at origin of anal fin	22.4	21.1 (17.5-23.6)	30
Pectoral fin length	19.2	17.7 (14.9-20.4)	20
Pelvic fin length	24.6	23.8 (21.2-26.3)	25
Base pelvic fin - anal fin origin	25.6	25.9 (22.1-29.8)	31

et al., 25 May 1982; USNM 374162, 1 male, 73 mm SL, Tutuila Bay, Samoa, R.C. Wass, 2 Oct. 2003; USNM 374163, 1 male, 59 mm SL, 18°08'S, 178°24'E, Fiji, V.G. Springer *et al.*, 19 April 1982; USNM 374191, 1 male, 53 mm SL, 05°52'S, 110°25'E, Karimundjawa Islands, Java, V.G. Springer *et al.*, 29 March 1974; WAM P. 30618-031, 1 male, 82 mm SL and 1 female, 53 mm SL, 00°S, 122°E, Togean Islands, Sulawesi, Indonesia; WAM P. 31144-025, 2 females, 39–74 mm SL, 05°18'S, 150°08'E, Kimbe Bay, Bismarck Archipelago, Papua New Guinea, G.R. Allen, 20 April 1996; WAM P. 31438-006, 1 female, 81 mm SL, 12°15'S, 122°58'E, Ashmore Reef, Timor Sea, Western Australia, J.B. Hutchins, 3 Oct. 1997; ZMUC P 771472, 1 male, 78 mm SL and ZMUC P 771473, 1 female, 72 mm SL, same data as USNM 372961.

Additional specimens. AMS I. 17499-003, 1 male, 85 mm SL, Solomon Islands, Florida Island; AMS I. 22611-017, 1 female, 74 mm SL, Escape Reef, Great Barrier Reef, Queensland, Australia; AMS I. 22612-010, 1 female 59 mm SL, Escape Reef, Great Barrier Reef, Queensland, Australia; AMS I. 22619-006, 1 female, 62 mm SL, Escape Reef, Great Barrier Reef, Queensland, Australia; AMS I. 39048-021, 1 female, 73 mm SL, Solomon Islands, Stewart Island; USNM 358482, 1 female, 58 mm SL, 16°36'S, 168°09'E, Vanuatu; USNM 366850, 1 female, 85 mm SL, 17°06'S, 177°13'E, Fiji.

Diagnosis. Vertebrae 11+33–35=44–46, dorsal fin rays 84–91, anal fin rays 65–74; eyes large (2.6–3.5% SL); outer pseudoclasper massive, hook-shaped, very broad in ventral view; inner pseudoclasper stout, fleshy, not extending over anterior rim of outer pseudoclasper; broad scale patch on cheek, large scale patch on operculum continuous above and below opercular spine.

Description. The principal meristic and morphometric characters are shown in Table 9. Body moderately compact, often high-necked, highest in front of origin of dorsal fin, snout fleshy; fishes large, mature at about 55 to 60 mm SL. Head with broad scale patch on cheek and continuous and broad scale patch on operculum above and below opercular spine, sometimes almost the size of the scale patch on the cheek. Horizontal diameter of scales on body about 1.7% SL. Maxillaries expanded posteriorly with prominent angle at rear ventral corner. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril partly covered by large flap anteriorly, about twice the size of anterior nostril and about 1/4 the size of eye.

Head sensory pores (Fig. 19 A–C). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 7 rows of granular teeth and two rows of larger teeth at symphysis, followed by about 11 rows of granular teeth posteriorly. Vomer horseshoe-shaped, with 2 rows of teeth, the posterior with 2–3 fang-like teeth. Palatine teeth in 3 rows of 15, 10 and 12 teeth, largest on inner row. Dentary with 5 outer rows of granular teeth and 2 inner rows of anteriorly larger teeth, blending into 1 row of 15 large fangs posteriorly, fang size up to about 2/3 of pupil diameter.

Otolith (Fig. 19 H–I). Moderately elongate with a pointed, dorsally shifted posterior tip, length to height 1.9–2.0 (52–81 mm SL); otolith length to sulcus length 1.9–2.0; sulcus not inclined. Anterior tip of otolith pointed; dorsal rim rather flat posteriorly without or with weak postdorsal angle in otolith of females, with more pronounced postdorsal angle in otoliths of males.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–9 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore slightly elongated, not reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 19 D–G). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper broad, hook-shaped and massive; inner pseudoclasper stout, fleshy, massive, sometimes enveloped from the outside by fleshy forward extension at the base of the outer pseudoclasper. Isthmus between pseudoclaspers wide. Penis short, curved, thick.

Coloration. Live colour unknown. Uniformly light brown when preserved.

Comparison. *Diancistrus beateae* belongs to the large group with hook- or stick-like outer pseudoclaspers. It differs from all other species in the group by the very

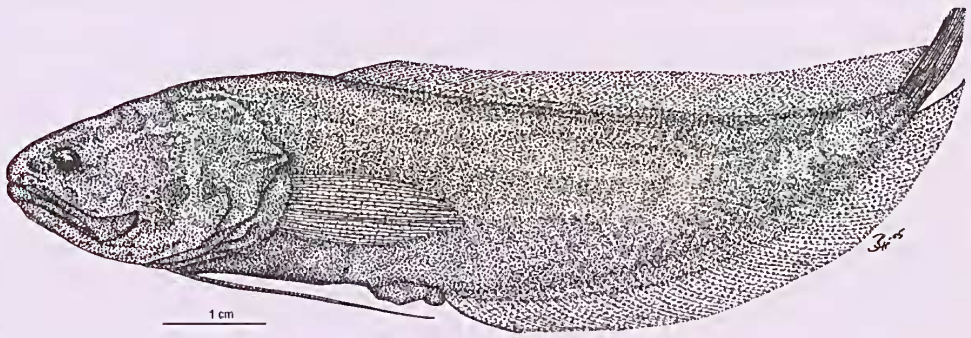

Fig. 18. *Diancistrus beateae* n. sp. Holotype. CAS 222746, male, 87 mm SL.

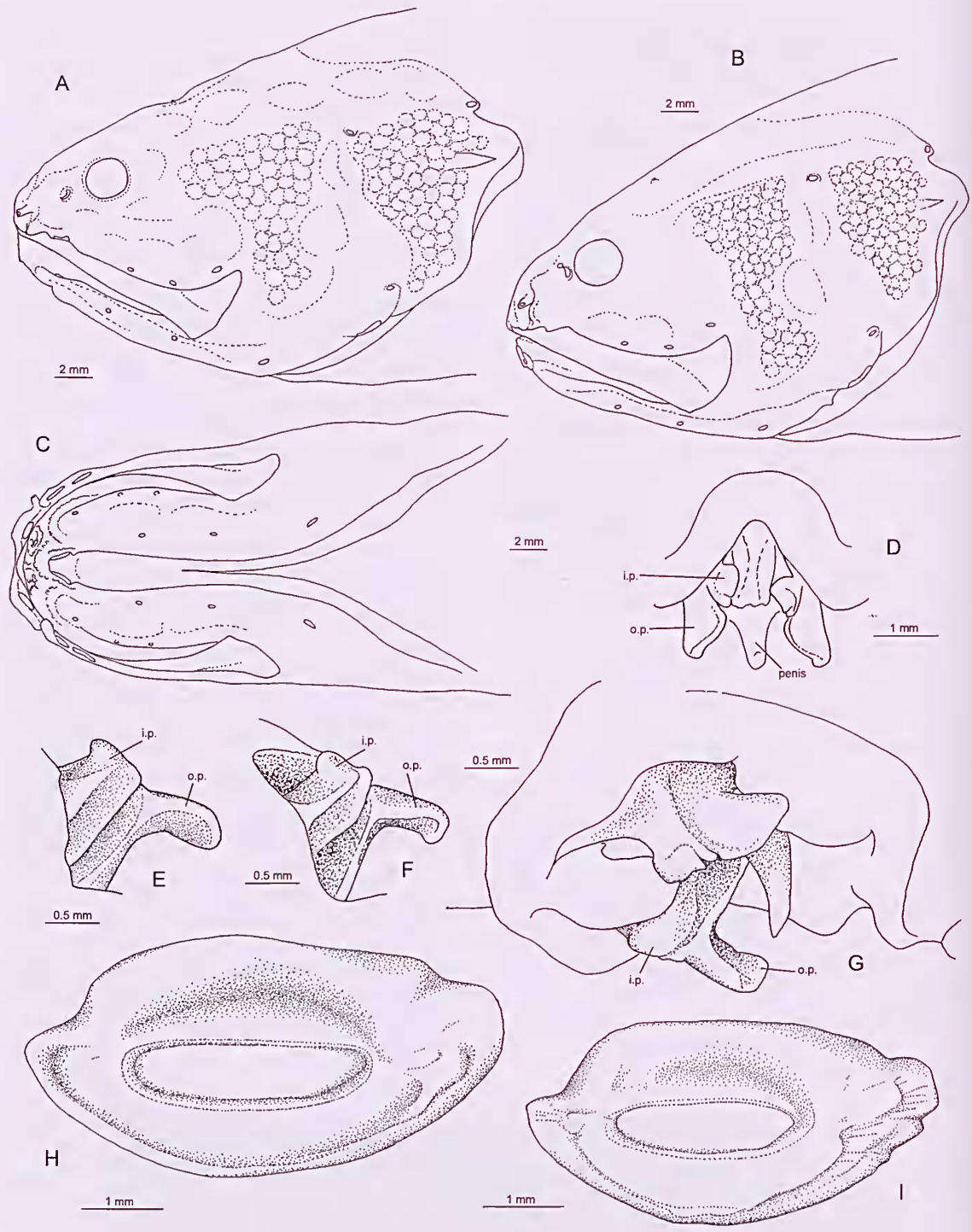

Fig. 19. *Diancistrus beateae* n. sp. **A**, lateral view of head, holotype; **B**, lateral view of head, WAM P. 30618-031, male, 81 mm SL; **C**, ventral view of head, holotype; **D**, ventral view of male copulatory organ, USNM 372967, 96 mm SL; **E**, view of left pseudoclasper from inside, holotype; **F**, view of left pseudoclasper from inside, USNM 372967, 96 mm SL; **G**, inclined lateral view of male copulatory organ, USNM 372967, 96 mm SL; **H**, median view of right otolith, WAM P. 31438-006, female, 81 mm SL; **I**, median view of right otolith, AMS I. 33731-069, male, 71 mm SL.

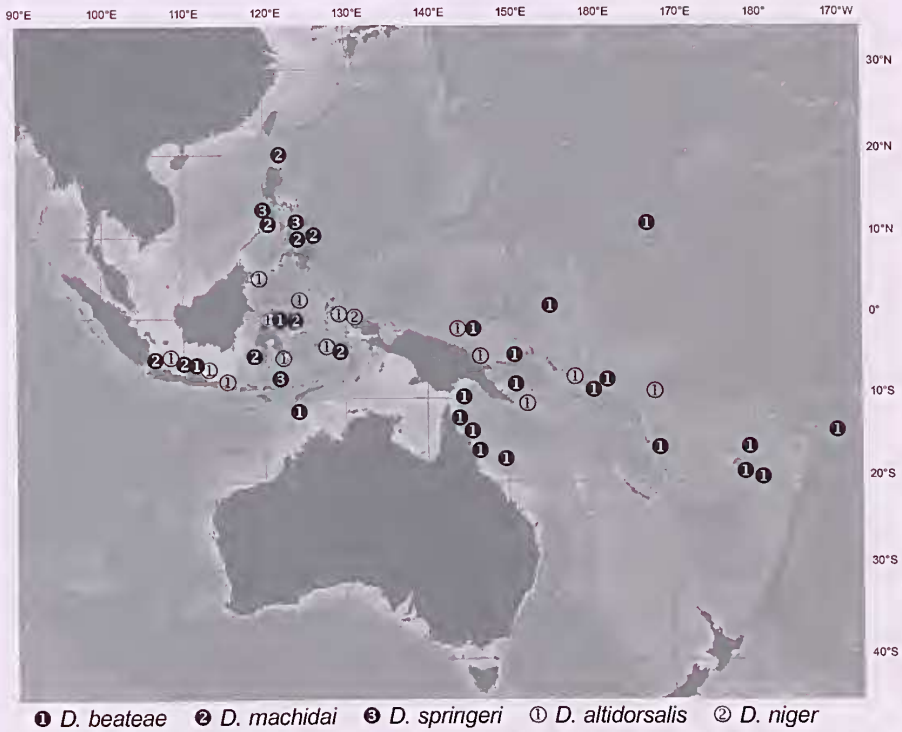

Fig. 20. Sample sites of *Diancistrus beateae* n. sp., *D. machidai* n. sp., *D. springeri* n. sp., *D. altidorsalis* n. sp. and *D. niger* n. sp. One symbol may represent several samples.

broad and massive outer pseudoclasper, which is best seen in ventral view after bending forward the hood cover. Together with *D. karinae* n. sp. it is the only species of the genus *Diancistrus* with a complete scale cover on the operculum above and below the opercular spine and joined around it, which makes it an easily recognizable species despite its wide geographical range and co-occurrence with several other species of the genus. From *D. karinae* n. sp. it differs in the pseudoclasper morphology (broad hook-shaped versus flat wing-shaped) and also in the larger number of dorsal fin rays (84–91 versus 78–83) and the mostly lower D/V (6 versus 7). *Diancistrus beateae* is one of the largest species of Dinematichthyini with a maximum recorded size of 132 mm SL.

Distribution (Fig. 20). *Diancistrus beateae* is amongst the more widespread *Diancistrus* species, with a single record each from the Marshall Islands (Rongelap) and Micronesia (Kapingamarangi) in the north, to Sulawesi and New Guinea and further to the Solomon and Vanuatu Islands, Fiji and Samoa in the south-east. It further occurs along the Great Barrier Reef and is also known from a few isolated localities to the south-west, off Java and in the Timor Sea. In the central part of its distribution area (Sulawesi, New Guinea) *D. beateae* overlaps with *D. karinae* with which it may be confused most easily in the absence of males.

Etymology. Named after Beate Schwarzhans for her most valuable support of her husband during his many hours invested in this study.

Diancistrus brevirostris n. sp.

(Figs 21, 22, 29; Table 10)

Material examined. (11 specimens, 20–59 mm SL). Holotype – USNM 338982, male, 41 mm SL, 20°29'S, 166°19'E, Ouvea Atoll, Ile Haute, Loyalty Islands, deep surge channel on ocean side of reef at 3–10 m, J. T. Williams, J.-L. Menou and P. Tirard, 19 Nov. 1991. Paratypes – SMNS 21614, 1 female, 59 mm SL, 21°35'37''S, 167°50'51''E, Cap Wabao, 6 km SW Tadin, Maré Island, Loyalty Islands, coralline rock on side of exposed reef channel and cave, 1–5 m depth, R. Fricke, 16 July 1999; USNM 338982, 1 male, 33 mm SL and 1 female, 58 mm SL, same data as holotype; USNM 356170, 1 male, 35 mm SL, 17°03'S, 168°21'E, Shepherd Islands, Emae Island, Vanuatu, J. T. Williams *et al.*, 28 April 1999; USNM 361739, 3 females, 39–44 mm SL, 17°31'S, 168°19'E, Efate Island, Vanuatu, J. T. Williams *et al.*, 4 May 1997.

Tentatively assigned specimens. USNM 338982, 1 juvenile, 21 mm SL, same location as holotype; USNM 356170, 2 females, 20 mm SL, 17°03'S, 168°21'E, Emae Island, Vanuatu.

Diagnosis. Vertebrae 11+32–34=43–45, dorsal fin rays 71–82, anal fin rays 58–69; eyes large (2.3–2.8% SL); outer

Table 10. Meristic and morphometric characters of *Diancistrus brevirostris* n. sp.

	Holotype USNM 338982	Holotype + 7 paratypes	n
		Mean (range)	
Standard length in mm	41	43.9 (33-58)	8
Meristic characters			
Dorsal fin rays	79	77.0 (71-82)	5
Anal fin rays	63	63.2 (58-69)	5
Pectoral fin rays	20	19.9 (18-21)	8
Precaudal vertebrae	11	11	5
Caudal vertebrae	33	32.8 (32-34)	5
Total vertebrae	44	43.8 (43-45)	5
Rakers on anterior gill arch	14	15.5 (13-19)	4
Pseudobranchial filaments	-	2	5
D/V	7	6.6 (6-7)	5
D/A	21	19.8 (17-22)	5
V/A	14	13.6 (13-14)	5
Morphometric characters in % of SL			
Head length	24.8	25.9 (24.8-26.7)	8
Head width	13.3	12.3 (10.3-14.0)	8
Head height	14.3	18.1 (14.3-21.1)	8
Upper jaw length	11.9	12.5 (11.9-13.3)	8
Maxillary height	4.3	4.0 (3.8-4.3)	8
Diameter of pigmented eye	2.4	2.5 (2.3-2.8)	8
Interorbital width	6.4	5.4 (4.1-7.3)	8
Postorbital length	18.1	18.5 (18.1-19.3)	8
Preanal length	48.4	46.6 (43.6-51.4)	8
Predorsal length	30.4	32.2 (30.4-34.1)	8
Body depth at origin of anal fin	16.9	18.1 (16.2-20.1)	8
Pectoral fin length	15.4	16.7 (14.1-19.6)	7
Pelvic fin length	26.1	23.7 (20.9-26.1)	8
Base pelvic fin - anal fin origin	29.7	27.3 (24.9-29.7)	8

pseudoclasper moderately large, broad, wing-shaped, its tip slightly bent outwards, with a characteristic kink at the base seen from ventral view; inner pseudoclasper bifurcate, both branches of about equal length, broad based, flap-like; narrow scale patch on cheek with 4–5 scale rows, no scales on opercuIum; head short, with blunt snout; otolith thick with gently curving dorsal rim.

Description. The principal meristic and morphometric characters are shown in Table 10. Body slender, but with short massive head and blunt snout, fishes small, mature at about 35 mm SL. Head with 4–5 scale rows on upper cheek, no scales on operculum. Horizontal diameter of scales on body about 1.9% SL. Maxillaries slightly expanded posteriorly with knob near rear ventral corner. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril slightly larger than anterior nostril and about 1/5 the size of eye.

Head sensory pores (Fig. 22 A–C). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior); the 1st anterior mandibular pore not tubular and without cirri. Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 5 rows of granular teeth and 1 row of larger teeth at symphysis, followed by about 5 rows of granular teeth posteriorly. Vomer horseshoe-shaped, with 3 tooth rows, the larger teeth on inner row posteriorly. Palatine teeth in 2 rows of equally long teeth. Dentary with 5 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, blending into 1 row of 5 large fangs posteriorly, up to about 3/4 of pupil diameter.

Otolith (Fig. 22 H–I). Moderately elongate with sharply pointed anterior and rounded posterior tip, length to height 2.0 (33–41 mm SL); otolith length to sulcus length 2.0–2.2; sulcus not inclined; dorsal rim regularly curving, almost symmetrical to ventral rim.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–9 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, sometimes reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 22 D–G). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper broad, wing-shaped, its tip slightly bent outwards, with characteristic kink at the outer side and base when seen from ventral view, resulting in square-shaped appearance; inner pseudoclasper bifurcate, both branches of about equal length, broad-based, flap-like. Isthmus between pseudoclaspers narrow. Penis short, curved, stout.

Coloration. Live colour not known. Uniformly light brown when preserved.

Comparison. *Diancistrus brevirostris* belongs to the small group with wing-shaped outer pseudoclaspers and bifurcate inner pseudoclaspers, which further contains *D. alatus, D. fijiensis* n. sp. and *D. jackrandalli* n. sp. Of those, *D. fijiensis* n. sp. is closest in meristics, with the large eye, the absence of scales on the opercuIum (all of which is also shared with *D. alatus*) and the two branches

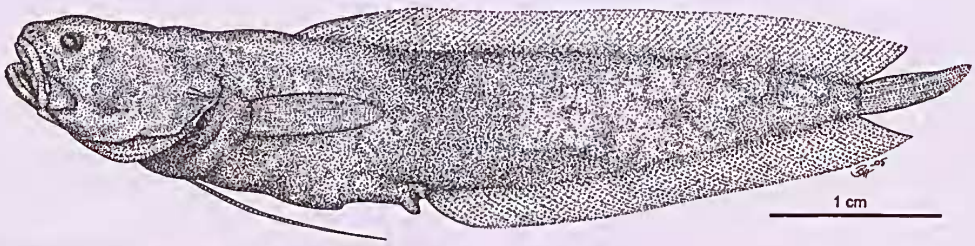

Fig. 21. *Diancistrus brevirostris* n. sp. Holotype. USNM 338982, male, 41 mm SL.

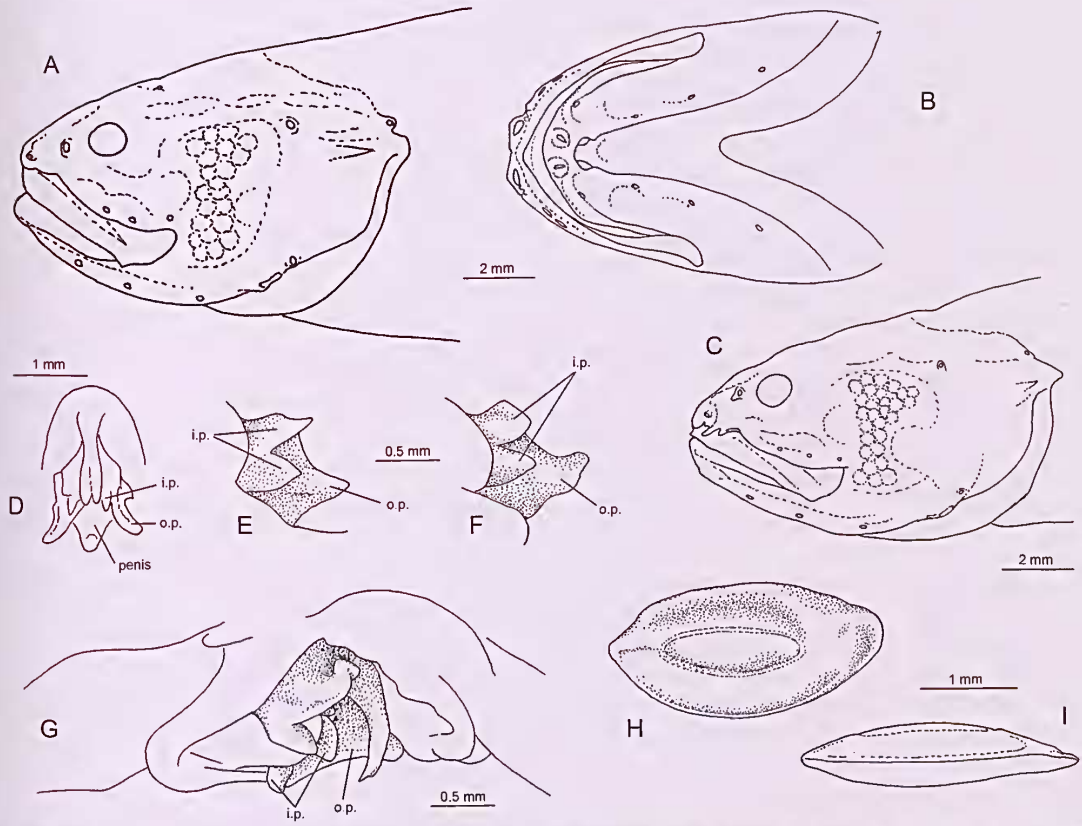

Fig. 22. *Diancistrus brevirostris* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, lateral view of head, USNM 356170, male, 35 mm SL; **D**, ventral view of male copulatory organ, USNM 356170, male, 35 mm SL; **E**, view of left pseudoclasper from inside, USNM 356170, male, 35 mm SL; **F**, view of left pseudoclasper from inside, holotype; **G**, inclined lateral view of male copulatory organ, holotype; **H**, median view of right otolith, holotype; **I**, ventral view of right otolith, holotype.

of the bifureate inner pseudoclasper being equally long (the anterior branch being twice as long as the posterior in *D. alatus*). *Diancistrus brevirostris* differs from *D. fijiensis* n. sp. in the broad based flap-like nature of the bifurcate inner pseudoclasper (versus narrow-based and sharply pointed), the characteristic kink at the outer side of the outer pseudoclasper base seen in ventral view and the more massive head and blunt snout. Also *D. fijiensis* n. sp. generally has fewer and larger scales on the cheek than *D. brevirostris*.

In Vanuatu, *D. brevirostris* may occur associated with *D. allcni, D. beateae, D. mcgroutheri* n. sp. and *D. novaeguineae*. *Diancistrus mcgroutheri* n. sp. belongs to the group with ear-lobe shaped outer pseudoclaspers and small eyes; the other species are readily distinguished by the presence of scales on the operculum. A further similar looking species occurring in Vanuatu is *Paradiancistrus acutirostris* n. sp. This species is recognized by the curved structure of the fused inner and outer pseudoclaspers, the presence of only one lower preopercular pore (versus 3) and the very narrow scale patch on the cheek (2 scale rows on upper cheek versus 4–5). At the Loyalty Islands, *D. brevirostris* may co-occur with *D. longifilis* and *D. tongaensis* n. sp., both species without scales on the operculum. While *Diancistrus tongaensis* n. sp. belongs to the group with ear-lobe shaped outer pseudoclaspers and small eyes, *D. longifilis* would probably be the most easiest to confuse it with, in the absence of males. *Diancistrus longifilis* does exhibit a more slender, less blunt snout and has otoliths with marked pre- and postdorsal angles.

Distribution (Fig. 29). *Diancistrus brevirostris* is only known from the Loyalty Islands and some islands of Vanuatu.

Etymology. Named after short, blunt snout – *brevis* (Latin) = short and derivation of rostrum (*rostris* – Latin) = snouted.

Diancistrus eremitus n. sp.

(Figs 23, 24, 40; Table II)

Material examined. (6 specimens, 43–83 mm SL). Holotype – USNM 372957, male, 71 mm SL, 01°33'S, 144°59'E, Manus Province, Bismarck Sea, Bismarck Archipelago, Hermit Islands, Amot Island, ocean side of reef at drop off, Papua New Guinea, ocean side of reef

at drop off, 0–16 m, V.G. Springer *et al.*, 30 Oct. 1978. PARATYPES – CAS 2223206, 1 male, 43 mm SL, 1 female, 49 mm SL, 17°25'S, 179°10'W, Fiji, Lau Group, Mago Island NW side, sand, rubble and hard coral rock, D.W. Greenfield, K. Longenecker, and R. Langston, 3 Jan. 2003; USNM 372958, 2 males, 47–83 mm SL, 1 female, 49 mm SL, 08°23'S, 162°51'E, Stewart Island, Solomon Islands, J. T. Williams *et al.*, 3 Oct. 1998.

Diagnosis. Vertebrae 11+31–33=42–44, dorsal fin rays 83–86, anal fin rays 66–71; eyes very large (≥3.0% SL), D/V 5–6; outer pseudoclasper large, more than 2 times the length of inner pseudoclasper, wing-shaped, with broad base and slightly concave pointed tip without fleshy bulge; inner pseudoclasper joined to outer pseudoclasper anteriorly, thin, with single pointed tip, short, not extending over anterior part of outer pseudoclasper; moderately broad scale patch on cheek with 5–6 scale rows on upper cheek, small scale patch on operculum above opercular spine (4–5 scales in 2 rows); head massive; otolith moderately slender, length to height 1.9–2.0.

Description. The principal meristic and morphometric characters are shown in Table 11. Body moderately compact, highest behind origin of dorsal fin at about 10th dorsal fin ray, with massive head, fishes mature at about 50 mm SL. Head with moderately broad scale patch on cheek with 5–6 scale rows on upper cheek, small scale patch on operculum above opercular spine (4–5 scales) in 2 rows and no scales below opercular spine. Horizontal diameter of scales on body about 1.6% SL. Maxillaries expanded posteriorly with prominent knob at rear ventral corner. Anterior nostril low on snout, 1/3 distance from tip of snout to anterior margin of eye. Posterior nostril very small, size of anterior nostril and about 1/10th size of eye.

Head sensory pores (Fig. 24 A–B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 4 rows of granular teeth and two rows of larger teeth at symphysis, followed by 8 rows of granular teeth posteriorly. Vomer horseshoe-shaped, with 3 rows of teeth, the posterior with enlarged teeth. Palatine teeth in two rows of 15 and 8 teeth, the inner row with fewer and larger teeth. Dentary with 5 outer rows of granular teeth and 2 inner rows of larger teeth anteriorly blending into 1 row of 3–4 large fangs posteriorly, up to more than 1/2 of pupil diameter.

Otolith (Fig. 24 H–K). Moderately elongate with moderately pointed anterior and posterior tips, length to height 1.9–2.0 (50–85 mm SL); otolith length to sulcus length 1.85–2.0; sulcus slightly inclined at 5°. Dorsal angle weak or absent in otoliths of females, more pronounced in otoliths of males.

Table 11. Meristic and morphometric characters of *Diancistrus eremitus* n. sp.

	Holotype USNM 372957	Holotype + 3 paratypes	n
		Mean (range)	
Standard length in mm	71	62.5 (47-83)	4
Meristic characters			
Dorsal fin rays	85	84.5 (83-86)	4
Anal fin rays	67	68.3 (66-71)	4
Pectoral fin rays	20	20	2
Precaudal vertebrae	11	11	4
Caudal vertebrae	31	32.0 (31-33)	4
Total vertebrae	42	43.0 (42-44)	4
Rakers on anterior gill arch	15	15	2
Pseudobranchial filaments	2	2	4
D/V	5	5.8 (5-6)	4
D/A	24	22.7 (22-24)	4
V/A	13	13.3 (13-14)	4
Morphometric characters in % of SL			
Head length	25.8	27.6 (25.8-29.5)	4
Head width	13.2	12.9 (11.6-14.8)	4
Head height	22.1	20.6 (19.0-22.1)	4
Upper jaw length	13.7	13.5 (13.0-14.2)	4
Maxillary height	5.2	4.8 (4.3-5.2)	4
Diameter of pigmented eye	3.2	3.1 (3.0-3.3)	4
Interorbital width	6.5	5.7 (5.1-6.5)	4
Postorbital length	18.6	19.2 (18.6-20.5)	4
Preanal length	49.0	49.6 (47.7-52.0)	4
Predorsal length	32.8	33.3 (32.8-33.7)	4
Body depth at origin of anal fin	19.3	19.7 (18.3-21.8)	4
Pectoral fin length	-	17.1 (16.1-18.0)	2
Pelvic fin length	23.2	22.1 (19.2-23.2)	4
Base pelvic fin - anal fin origin	28.3	27.6 (26.1-28.9)	4

Fig. 23. *Diancistrus eremitus* n. sp. Holotype. USNM 372957, male, 71 mm SL.

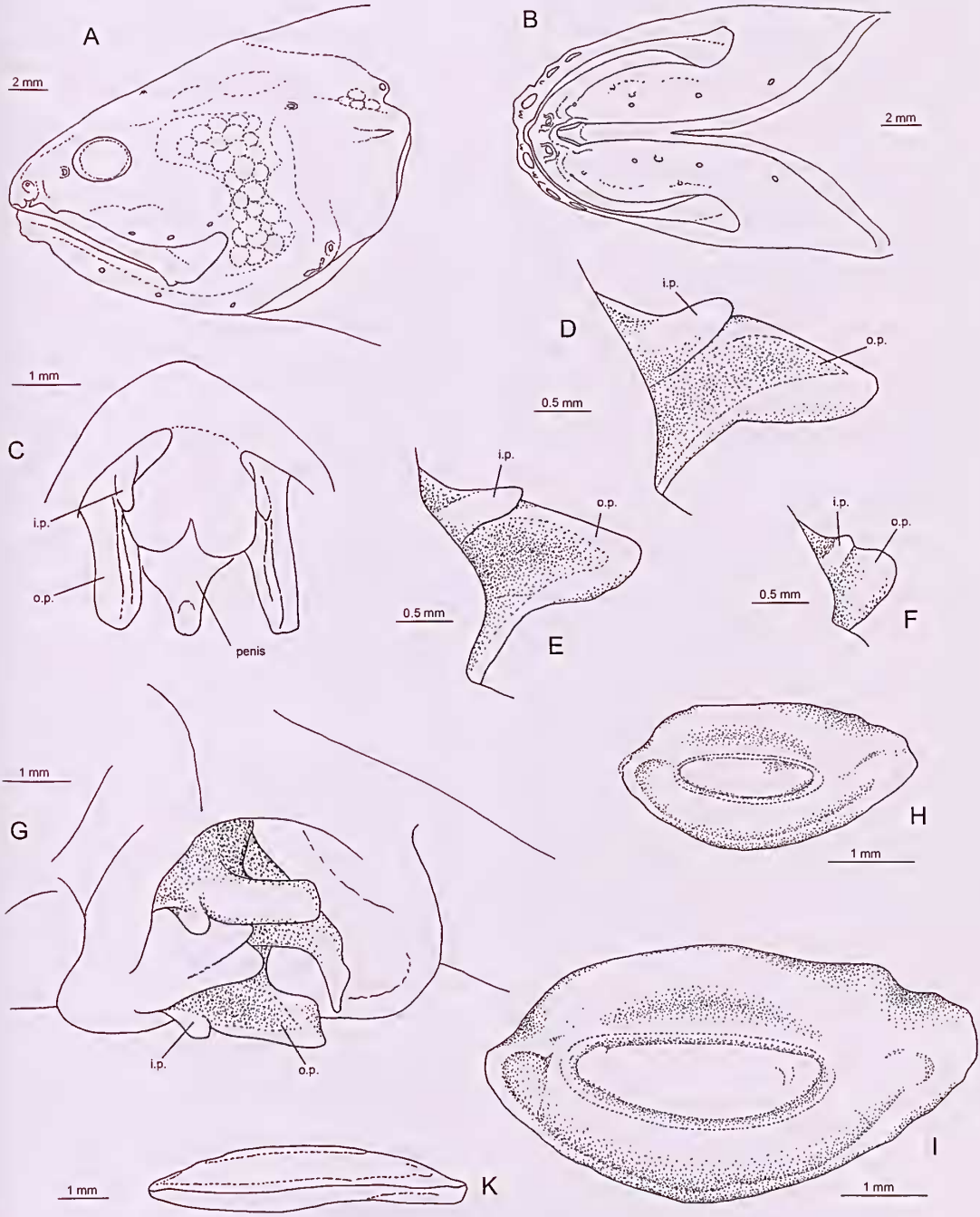

Fig. 24. *Diancistrus eremitus* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, ventral view of male copulatory organ, USNM 372958, male, 83 mm SL; **D**, view of left pseudoclasper from inside, USNM 372958, male, 83 mm SL; **E**, ventral view of male copulatory organ, holotype; **F**, view of left pseudoclasper from inside, USNM 372958, male, 47 mm SL; **G**, inclined lateral view of male copulatory organ, USNM 372958, male, 83 mm SL; **H**, median view of right otolith, USNM 372958, male, 47 mm SL; **I**, median view of right otolith, USNM 372958, male, 83 mm SL; **K**, ventral view of right otolith, USNM 372958, male, 83 mm SL.

Axial skeleton (of holotype). Neural spine of vertebrae 4 inclined and 5–8 depressed. Parapophyses present from vertebra 6 to 11. Pleural ribs on vertebrae 2–10 (11). First anal fin pterygiophore slightly elongated, not reaching tip of last precaudal parapophysis in males, short in females.

Male copulatory organ (Fig. 24 C–G). Two pairs of large pseudoclaspers. Outer pseudoclasper large, more than 2 times the length of inner pseudoclasper, wing-shaped, with broad base and slightly concave pointed tip, not bending outwards, with broad supporter; inner pseudoclasper joined to outer pseudoclasper anteriorly, thin, with single pointed tip, short, not extending over anterior part of outer pseudoclasper. Isthmus between pseudoclaspers wide. Penis short, curved, with thin pointed tip. An ontogenetic succession of pseudoclaspers from three males of different sizes of *D. eremitus* shows a reduced morphological expression in the smallest subadult specimen.

Coloration. Live colour not known. Uniformly light brown when preserved.

Comparison. *Diancistrus eremitus* belongs to the group with wing-shaped outer pseudoclasper and a single-tipped inner pseudoclasper, which further contains *D. jeffjohnsoni* n. sp., *D. karinae* n. sp., *D. katrineae* n. sp., *D. mennei* n. sp. and *D. polupeiensis* n. sp. Of these, *D. mennei* n. sp. and *D. polupeiensis* n. sp. are closest. It differs from *D. mennei* n. sp. in the fewer scales above the opercular spine (4 versus 8) and the large outer pseudoclasper of more than 2 times the length of the inner pseudoclasper (versus 1½ length of inner pseudoclasper). From *D. polupeiensis* n. sp. it differs in the absence of a fleshy bulge posteriorly at the outer pseudoclasper, 4 scales above the opercular spine in 2 rows (versus 2–3 in a single row) and the number of vertebrae (42–44 versus 45–46). These three species do not seem to overlap geographically, i.e. they presumably replace each other in their respective areas of occurrence.

At Hermit Island, New Guinea, *Diancistrus eremitus* is associated with *D. alleni, D. altidorsalis, D. atollorum, D. beateae* and *D. karinae* n. sp.. Of these, *D. eremitus* is easiest to confuse with *D. alleni* in females. *Diancistrus eremitus* has 4 scales in 2 rows above the opercular spine in a single row, whereas *D. alleni* has 1 or 2, rarely 3 scales. No other species are known from the Stewart Islands, but from the nearby main Solomon Islands, where *D. eremitus* seems to be missing, *D. alleni, D. megroutheri* n. sp. and *D. novaeguineae* have been recorded.

Distribution (Fig. 40). *Diancistrus eremitus* is known only from three oceanic islands off the north coast of the New Guinea-Solomon Island chain respectively, namely the Hermit Island and Stewart Islands, and from one location off western Fiji in the Lau Group.

Etymology. Named after the Latin translation (= *eremitus*) of the type locality – Hermit Island.

Diancistrus erythraeus (Fowler, 1946)

(Figs 17, 25, 26; Table 12)

Calcarbrotula erythraea Fowler, 1946: 193, fig. 57–58 (type locality: Aguni Shima, Ryukyu Islands, Japan).

Brotulina erythraea – Machida in Masuda *et al.* 1984: 101; Nielsen *et al.* 1999: 126.

Material examined. (11 specimens, 30–70 mm SL). Holotype – ANSP 72069, female, 64 mm SL, Aguni Shima, Ryukyu Islands, Japan, E.R. Tinkham.

Additional specimens. BPBM 8710, 1 male, 38 mm SL and 3 females, 30–55 mm SL, Ishigaki-jima, Ryukyu Islands, J.E. Randall and A.H Banner, 22 May 1968; USNM 365838, 1 female, 70 mm SL, 16°26'N, 119°56'E, Pangasian Island, Philippines, E.O. Murdy, 16–17 April 1980; USNM 372955, 1 male, 34 mm SL and 1 female, 47 mm SL, 10°52'30"N 120°56'00"E, Palawan Province, Bararin Island, W side (Cuyo Island), Philippines, 0–14 m depth, 23 May 1978; USNM 374197, 2 males, 33–44 mm SL, Philippines; USNM 374199, 1 male, 35 mm SL, 24°27'N, 124°12'E, Ishigaki-jima, Ryukyu Islands, J. T. Williams *et al.*, 23 Feb. 1998.

Diagnosis. Vertebrae 11+28–30=39–41, dorsal fin rays 70–76, anal fin rays 55–61; eyes very small (<2.0% SL); outer pseudoclasper ear-lobe shaped, the half-moon shaped

Table 12. Meristic and morphometric characters of *Diancistrus erythraeus* (Fowler, 1946).

	Holotype ANSP 72069	Holotype + 10 specimens	n
		Mean (range)	
Standard length in mm	64	44.1 (30-70)	11
Meristic characters			
Dorsal fin rays	73	73.3 (70-76)	11
Anal fin rays	61	58.5 (55-61)	11
Pectoral fin rays	-	20.4 (20-21)	9
Precaudal vertebrae	10	10.9 (10-11)	11
Caudal vertebrae	30	29.3 (28-30)	11
Total vertebrae	40	40.3 (39-41)	11
Rakers on anterior gill arch	15	15.7 (14-18)	11
Pseudobranchial filaments	2	1.5 (0, 2)	11
D/V	7	6.3 (6-7)	11
D/A	18	19.2 (18-21)	11
V/A	13	13	11
Morphometric characters in % of SL			
Head length	28.2	27.6 (26.2-29.0)	11
Head width	12.9	13.1 (11.6-15.6)	11
Head height	16.6	17.0 (15.9-18.7)	11
Upper jaw length	14.9	13.9 (13.0-14.9)	11
Maxillary height	5.2	4.3 (3.8-5.2)	11
Diameter of pigmented eye	1.6	1.6 (1.2-1.9)	11
Interorbital width	7.5	6.9 (6.2-7.5)	11
Postorbital length	21.7	20.8 (19.7-21.7)	10
Preanal length	48.1	47.2 (45.1-49.9)	11
Predorsal length	33.8	32.8 (30.7-34.8)	11
Body depth at origin of anal fin	18.1	18.0 (15.9-19.8)	11
Pectoral fin length	15.7	15.7 (13.5-17.6)	11
Pelvic fin length	21.1	25.6 (21.1-28.6)	9
Base pelvic fin - anal fin origin	30.1	28.2 (25.3-31.0)	11

ear-lobe extension inwardly directed; inner pseudoelasper firmly joined to outer pseudoelasper anteriorly, with supporter, reduced small hook-like, often with a fleshy flap at its base; 5–7 rows of small scales on upper cheek, no scales on operculum; head profile slender; otolith length to height ratio <2.0.

Description (Fig. 25). The principal meristic and morphometric characters are shown in Table 12. Body moderately compact, with slender fleshy snout; fishes small, mature at about 30 to 35 mm SL. Head with narrow scale patch on cheek, no scales on operculum. Horizontal diameter of scales on body about 1.4% SL. Maxillaries expanded posteriorly with prominent angle or knob at rear ventral corner. Anterior nostril low on snout, 1/3 distance from tip of snout to anterior margin of eye. Posterior nostril about twice the size of anterior nostril and about 1/4 the size of eye.

Head sensory pores (Fig. 26 A-C). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of a 35 mm SL non-type – USNM 374199). Premaxilla with 5 rows of granular teeth and 1 row of larger teeth at symphysis, followed by 5 rows of granular teeth posteriorly. Vomer horseshoe-shaped, with 2 tooth rows, posterior row with larger teeth. Palatine teeth in two rows, inner row with larger teeth. Dentary with 4 outer granular tooth rows and 1 inner row of larger teeth anteriorly, blending into 1 row of 6 large fangs posteriorly, fangs up to 3/4 of pupil diameter.

Otolith (Fig. 26 G-H). Moderately elongate with rather blunt anterior and posterior tips resulting in a length to height relation of 2.0 (35 mm SL); otolith length to sulcus length 2.3; sulcus slightly inclined at 5°. Dorsal rim with rounded, obtuse pre- and postdorsal angles.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–9 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, but mostly not reaching tip of last preanal parapophysis.

Male copulatory organ (Fig. 26 D–F). Two pairs of moderately large pseudoelaspers. Outer pseudoclasper ear-lobe shaped, but incomplete like a half-moon extension, which is inwardly directed; inner pseudoelasper firmly joined to outer pseudoelasper anteriorly, with supporter, reduced to a small hook, often with a fleshy flap at its base. Isthmus between pseudoclaspers narrow. Penis short, curved, moderately slender.

Coloration. Live colour probably red according to Fowler (1946) and Machida (1984). Uniformly light brown when preserved.

Comparison. *Diancistrus erythraeus* belongs to the group of species with ear-lobe shaped outer pseudoelaspers and small eyes (*Diancistrus erythraeus* subgroup), further containing *D. atollorum, D. megrontheri* n. sp., *D. robustus* n. sp. and *D. tongaensis* n. sp. Except for *D. robustus* n. sp., the species of this subgroup are further characterized by the low number of vertebrae (39–41, rarely 42 versus 43 in *D. robustus* n. sp.) and the slender head (head width <16% SL versus >16% SL in *D. robustus* n. sp.). The remaining four species are best distinguished by means of pseudoelaspers. In *D. megrontheri* n. sp. and *D. tongaensis* n. sp. the inner pseudoelasper is free from the outer pseudoelasper, whereas in *D. atollorum* and *D. erythraens* (and *D. robustus* n. sp.) it is firmly joined to the outer pseudoelasper. Apparently, *D. erythraens* is closest to *D. atollorum*.

Diancistrus erythraens co-occurs with a number of *Diancistrus* species but is the only species with ear-lobe shaped outer pseudoclaspers. The only other small-eyed species with which it occurs along the Ryukyu Islands is *D. jackraudalli* n. sp., which readily differs in the form of the pseudoclaspers (wing-shaped outer pseudoclasper) and the presence of scales on the opercular above the opercular spine. *Diancistrus erythraens* does not seem to overlap in distribution with any other species of the *Diancistrus erythraeus* subgroup.

Remarks. Specimens from the Ryukyu Islands seem to have consistently smaller eyes than those from the northern Philippines, and they also seem to consistently lack the fleshy flap at the base of the inner pseudoelasper that is usually observed in specimens from the Philippines. More material needs to be investigated before it can be judged whether these subtle differences reflect the presence of two separate species.

Distribution (Fig. 17). *Diancistrus erythraens* is distributed along the Ryukyu Islands and along the northern Philippines, but is not known from Taiwan. To the south and east it is replaced by *D. atollorum*.

Fig. 25. *Diancistrus erythraeus* (Fowler, 1946). Holotype. ANSP 72069, female, 64 mm SL.

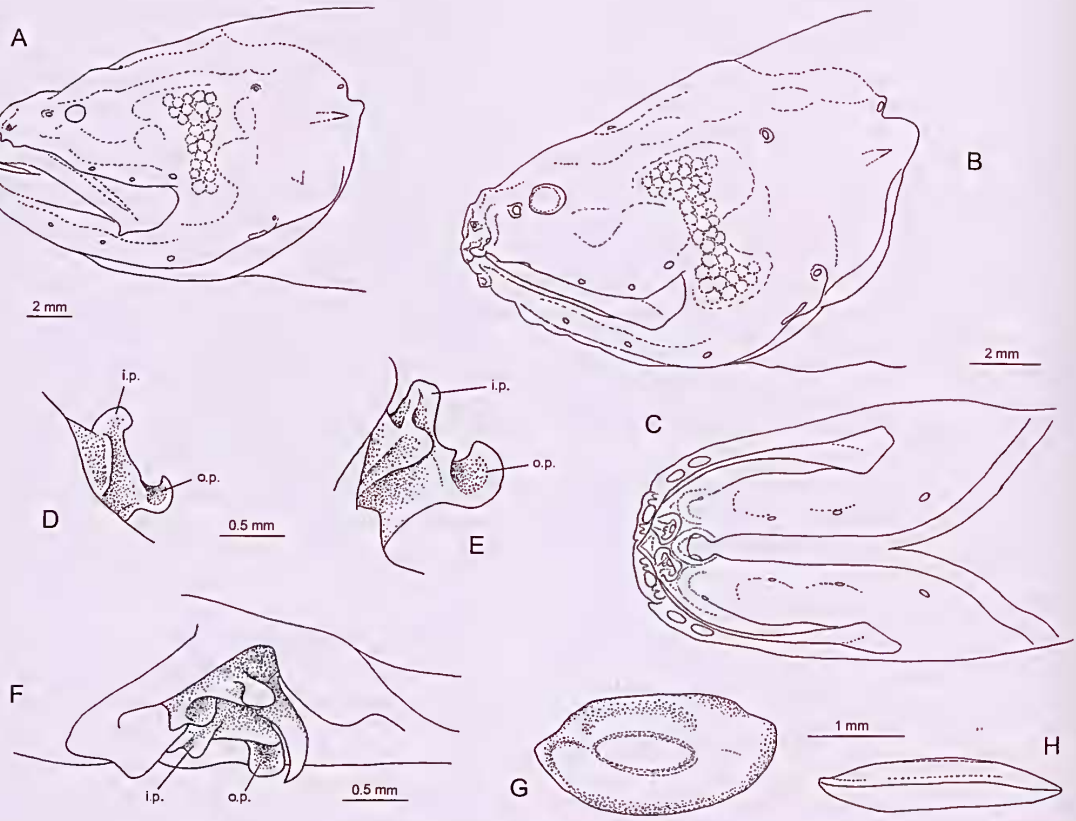

Fig. 26. *Diancistrus erythraeus* (Fowler, 1946). **A**, lateral view of head, BPBM 8710, female, 55 mm SL; **B**, lateral view of head, USNM 374197, male, 44 mm SL; **C**, ventral view of head, USNM 374197, male, 44 mm SL; **D**, view of left pseudoelasper from inside, BPBM 8710, 38 mm SL; **E**, view of left pseudoelasper from inside, USNM 374197, male, 44 mm SL; **F**, inelined lateral view of male copulatory organ, BPBM 8710, 38 mm SL; **G**, median view of right otolith, USNM 374199, male, 35 mm SL; **H**, ventral view of right otolith, USNM 374199, male, 35 mm SL.

Diancistrus fijiensis n. sp.

(Figs 27, 28, 29; Table 13)

Material examined. (20 specimens, 26–49 mm SL). Holotype – USNM 374161, male, 41 mm SL, 18°52'S, 178°30'E, Vuro Island, Great Astrolabe Reef, Fiji, inner reef, R. Bolin *et al.*, 8 May 1965. Paratypes – ROM 78115, 1 male, 31 mm SL, 18°S, 178°E, Fiji; USNM 366849, 1 male, 26 mm SL, 17°12'S, 176°54'E, Viwa Isl., Fiji, V.G. Springer *et al.*, 27 May 1982; USNM 372970, 1 male, 30 mm SL and 4 females, 28–42 mm SL, same data as the holotype; USNM 372972, 1 male, 39 mm SL, Mamanutha Group, NW end of Malolo Island, S side of channel, Fiji, 17°45'S, 177°04'W, 0–20 m depth, V.G. Springer *et al.*, 25 May 1982; USNM 374158, 1 male, 32 mm SL and 1 female, 32 mm SL, 18°50'S, 178°32'E, Mbulio Isl., Fiji, R. Bolin *et al.*, 28 Aug. 1963; USNM 374160, 1 male, 49 mm SL, 21°38'S, 178°45'W, Southern Lau Group, Ono-Ilau Island, outside barrier reef on NW side of island, Fiji, 15–18 m depth, V.G. Springer *et al.*, 1 May 1982; USNM 384591, 1 female, 30 mm SL, same data as holotype; WAM P. 30791-001, 1 male, 43 mm SL, 18°44'S, 178°29'E, Dravuni Isl., Fiji, A.R. Emery *et al.*, 31 March 1983; ZMUC P 771474, 1 male, 40 mm SL, same data as for USNM 374160; ZMUC P 771475, 1 female, 30 mm SL, same data as for USNM 384591.

Additional specimens. AMS I. 18438-015, 1 female, 49 mm SL, Fiji; USNM 259451, 3 females, 42–47 mm SL, 19°49'S, 178°15'W, Fiji.

Diagnosis. Vertebrae 11+31–33=42–44, dorsal fin rays 70–81, anal fin rays 58–63; eyes large (2.4–3.2% SL); outer pseudoclasper moderately large, broad-based, wing-shaped, its tip strongly bent outwards; inner pseudoclasper bifurcate, both branches of about equal length, narrow, thin, forming sharp spines; scale patch on cheek with 3–4 rows of large scales, no scales on operculum; head slender; 1st anterior mandibular pore large, tubular, forwardly directed; otolith thick with irregularly curved dorsal rim.

Description. The principal meristic and morphometric characters are shown in Table 13. Body slender, but with massive head and short snout; fishes small, mature at about

Table 13. Meristic and morphometric characters of *Diancistrus fijiensis* n. sp.

	Holotype USNM 374161	Holotype + 15 paratypes	n
		Mean (range)	
Standard length in mm	41	36.0 (26-48)	16
Meristic characters			
Dorsal fin rays	77	76.7 (70-81)	16
Anal fin rays	60	61.1 (58-63)	16
Pectoral fin rays	19	19.7 (18-21)	12
Precaudal vertebrae	11	11	16
Caudal vertebrae	32	32.0 (31-33)	16
Total vertebrae	43	43.0 (42-44)	16
Rakers on anterior gill arch	16	16.1 (14-18)	14
Pseudobranchial filaments	2	2	13
D/V	6	6.2 (6-7)	14
D/A	20	20.3 (18-22)	14
V/A	13	13.1 (13-14)	15
Morphometric characters in % of SL			
Head length	26.0	25.7 (24.5-27.0)	15
Head width	11.9	12.1 (10.0-13.8)	15
Head height	15.7	17.2 (15.4-21.5)	15
Upper jaw length	13.1	12.8 (11.9-13.9)	14
Maxillary height	4.4	4.1 (3.5-4.6)	13
Diameter of pigmented eye	2.7	2.8 (2.2-3.2)	15
Interorbital width	6.6	5.8 (4.0-7.3)	14
Postorbital length	17.9	18.1 (16.9-19.2)	15
Preanal length	48.1	46.9 (41.4-50.5)	15
Predorsal length	31.9	31.5 (29.5-34.1)	15
Body depth at origin of anal fin	16.4	16.9 (16.3-18.1)	14
Pectoral fin length	15.4	15.0 (12.8-16.7)	14
Pelvic fin length	26.8	25.3 (22.3-28.1)	9
Base pelvic fin - anal fin origin	29.5	27.1 (22.4-29.5)	14

30 mm SL. Head with 3–4 rows of large scales on cheek, no scales on operculum. Horizontal diameter of scales on body about 1.8% SL Maxillaries expanded posteriorly with angle at rear ventral corner. Anterior nostril low on snout, 1/3 distance from tip of snout to anterior margin of eye. Posterior nostril small, the size of anterior nostril and about 1/5 the size of eye.

Head sensory pores (Fig. 28 A-B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior): the 1st anterior mandibular pore tubular, large, pointing towards anterior and with single cirrus. Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 5 rows of granular teeth and 1 row of larger teeth at symphysis, followed by 5 rows of granular teeth posteriorly. Largest teeth up to ½ pupil diameter. Vomer horseshoe-shaped, with 2 tooth rows, posterior row with larger teeth. Palatine teeth in two rows, slightly larger on inner row. Dentary with 4 outer granular tooth rows and 1 inner row of larger teeth anteriorly, blending into 1 row of about 13 large fangs posteriorly, fangs up to more than 2/3 of pupil diameter.

Otolith (Fig. 28 G-H). Moderately elongate with broad anterior and rounded posterior tip, length to height 1.9 (49 mm SL); otolith length to sulcus length 2.0; sulcus markedly inclined at almost 10°; dorsal rim irregularly curving.

Axial skeleton (of holotype). Neural spine of vertebrae 4 inclined and 5–8 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10 (11). First anal fin pterygiophore elongated, sometimes reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 28 C-F). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper with broad base, wing-shaped, its tip strongly bent outwards, broad supporter; inner pseudoclasper bifurcate, both branches of about equal length, narrow, very thin and spiny. Isthmus between pseudoclaspers narrow. Penis short, curved, with broad base and thin tip.

Coloration. Live colour not known. Uniformly medium to dark brown when preserved.

Comparison. *Diancistrus fijiensis* belongs to the small group with wing-shaped outer pseudoclaspers and bifurcate inner pseudoclaspers, which further contains *D. alatus, D. brevirostris* and *D. jackrandalli* n. sp. Of these, *D. brevirostris* is the closest. For differentiation from *D. alatus* and *D. jackrandalli* n. sp. see their species accounts.

Other species of *Diancistrus* occurring in Fiji are *D. beateae,* with hook-shaped outer pseudoclaspers and extensive squamation on the operculum, *D. eremitus,* with wing-like outer pseudoclaspers and scales on the operculum above the opercular spine, and the two small-eyed species with ear-lobe outer pseudoclasper *D. robustus* n. sp. and *D. tongaensis* n. sp.

Distribution. *Diancistrus fijiensis* is only known from the Fiji Islands.

Etymology. Named after the type locality – Fiji.

Fig. 27. *Diancistrus fijiensis* n. sp. Holotype. USNM 374161, male, 41 mm SL.

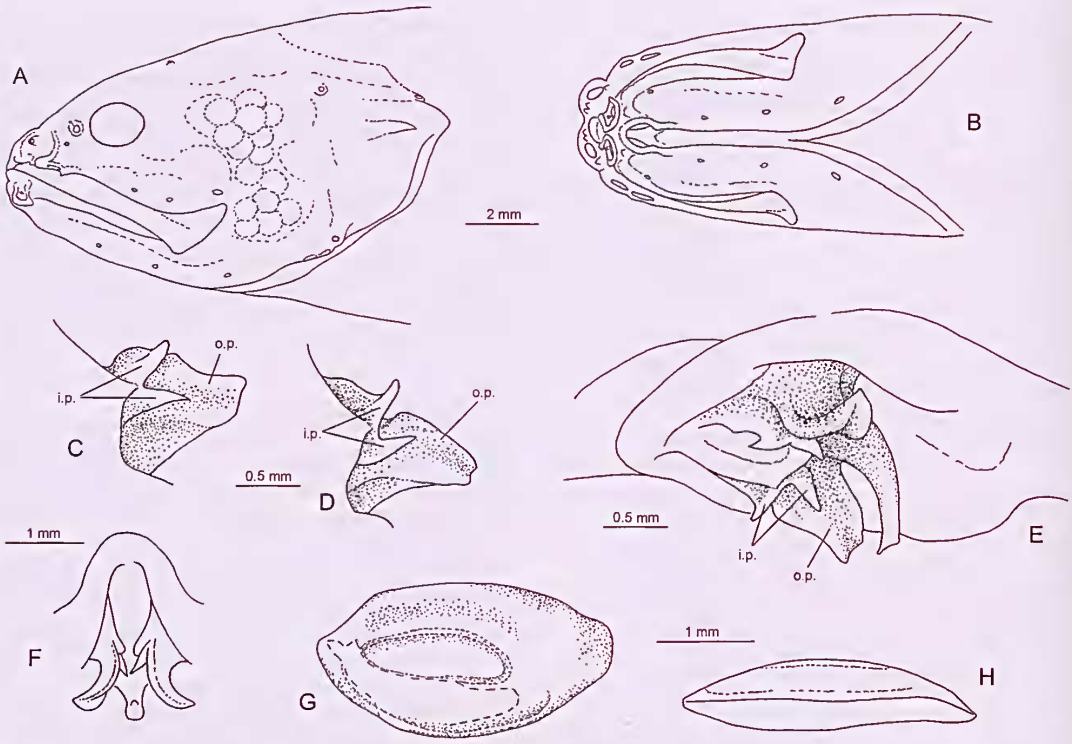

Fig. 28. *Diancistrus fijiensis* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, view of left pseudoclasper from inside, USNM 374160, 48 mm SL; **D**, view of left pseudoclasper from inside, USNM 374160, 44 mm SL; **E**, inclined lateral view of male copulatory organ, USNM 374160, 44 mm SL; **F**, ventral view of male copulatory organ, USNM 374160, 48 mm SL; **G**, median view of right otolith, USNM 374160, male, 44 mm SL; **H**, ventral view of right otolith, USNM 374160, male, 44 mm SL.

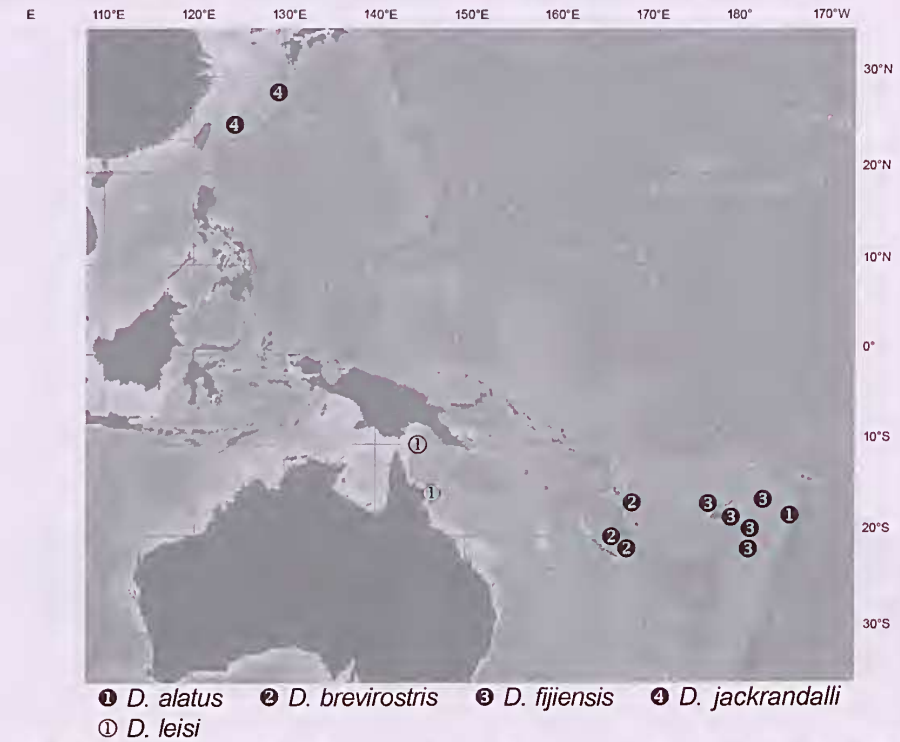

Fig. 29. Sample sites of *Diancistrus alatus* n. sp., *D. brevirostris* n. sp., *D. fijiensis* n. sp., *D. jackrandalli* n. sp. and *D. leisi* n. sp. One symbol may represent several samples.

Diancistrus fuscus (Fowler, 1946)

(Figs 30, 31, 57; Table 14)

Brotulina fusca Fowler, 1946: 195, fig. 59–60 (type locality: Aguni Shima, Ryukyu Islands, Japan).

Brotulina fusca – Machida in Masuda *et al.* 1984: 101; Chen and Shao 1991: 14; Nielsen *et al.* 1999: 126.

Material examined. (28 specimens, 27–67 mm SL). Holotype – ANSP 72070, male, 60 mm SL, Aguni Shima, Ryukyu Islands, Japan.

Additional specimens. BPBM 40212, 1 male, 50 mm SL, Ishigaki-jima, Ryukyu Islands, J.E. Randall and A.H Banner, 22 May 1968; NSMT P. 49441, 1 female, 62 mm SL, 24°19'N, 124°11'E, Ishigaki-jima, Ryukyu Islands, K. Matsuura, 7 Dec. 1995; USNM 372940, 1 male, 58 mm SL, 10°35'N, 122°08'E, Palawan, Philippines, J. T. Williams *et al.*, 25 Sept. 1995; USNM 372954, 2 males, 37–47 mm SL, Ch'uan-Fan-Shi, Taiwan, V.G. Springer *et al.*, 23 April 1968; USNM 372960, 1 male, 67 mm SL, 12°50'N, 120°45'E, Mindoro, Philippines, J. T. Williams, 10 Sept. 2003; USNM 374177, 1 male, 60 mm SL and 5 females, 47–58 mm SL, Ch'uan-Fan-Shi, Taiwan, V.G. Springer *et al.*, 23 April 1968; USNM 374180, 1 male, 43 mm SL, 24°27'N, 124°12'E, Ishigaki-jima, Ryukyu Islands, J. T. Williams *et al.*, 23 Feb. 1998; USNM 384594, 1 female, 28 mm SL, 10°53'N, 121°11'E, Cuyo Island NE of Palawan, Philippines, 0–21 m, 26 May 1978; USNM 384595, 1 male, 47 mm SL, 20°24'N, 121°55'E, Batanes Islands, Philippines, G.D. Johnson *et al.*, 1 May 1987; USNM 384596, 3 males, 41–56 mm SL and 3 females, 35–56 mm SL, 10°52'N, 120°56'E, Cuyo Islands, Palawan, Philippines, 23 May 1978; USNM 384598, 1 male, 52 mm SL and 1 female, 48 mm SL, 20°24'N, 121°55'E, Batanes Province, Philippines, G.D. Johnson *et al.*, 2 May 1987; YCM-P 36436, 1 female, 62 mm SL, Kakeroma Island, Amami Islands, northern Ryukyu Islands; YCM-P 36596, 1 female, 48 mm SL, Kakeroma Island, Amami Islands, northern Ryukyu Islands; ZMUC P 771484, 1 male, 48 mm SL and ZMUC P 771485, 1 female, 43 mm SL, same data as for USNM 384596.

Diagnosis. Vertebrae 11+32–34=43–45, dorsal fin rays 74–85 (usually >77), anal fin rays 58–69, D/V 6 (rarely 7); eyes moderately large (2.4–3.4% SL); outer pseudoclasper with hook-shaped extension oriented backward at 90° angle and slightly bent outwards and with rounded tip; inner pseudoclasper short, joined to outer pseudoclasper anteriorly, with supporter, with small hook and wide thin flap at its base; scale patch on cheek with 5–6 scale rows on upper cheek, scales on operculum only above opercular spine, 3–7 scales in 2 rows; head profile slender, broad; otolith length to sulcus length ≤2.0, sulcus not inclined.

Table 14. Meristic and morphometric characters of *Diancistrus fuscus* (Fowler, 1946).

	Holotype ANSP 72070	Holotype + 27 specimens	n
		Mean (range)	
Standard length in mm	60	50.4 (27-66)	28
Meristic characters			
Dorsal fin rays	82	79.4 (74-85)	28
Anal fin rays	65	64.7 (58-69)	28
Pectoral fin rays	-	18.3 (17-20)	19
Precaudal vertebrae	11	11	28
Caudal vertebrae	33	32.8 (32-34)	28
Total vertebrae	44	43.8 (43-45)	28
Rakers on anterior gill arch	16	15.2 (13-17)	22
Pseudobranchial filaments	1	1.7 (0-2)	21
D/V	7	6.3 (6-7)	28
D/A	20	19.4 (18-22)	28
V/A	14	13.2 (12-14)	28
Morphometric characters in % of SL			
Head length	25.3	26.9 (25.3-28.9)	24
Head width	13.9	12.7 (11.0-15.7)	24
Head height	15.8	18.1 (15.8-21.2)	22
Upper jaw length	13.2	13.1 (11.8-14.4)	25
Maxillary height	4.1	4.4 (3.9-5.0)	24
Diameter of pigmented eye	2.7	2.9 (2.4-3.4)	24
Interorbital width	7.0	6.0 (4.1-8.5)	25
Postorbital length	17.6	19.3 (17.6-21.4)	25
Preanal length	47.4	47.8 (43.9-57.3)	25
Predorsal length	27.7	33.3 (27.7-35.8)	24
Body depth at origin of anal fin	17.6	18.5 (16.7-20.6)	25
Pectoral fin length	14.3	16.0 (14.0-21.8)	22
Pelvic fin length	21.3	23.7 (19.1-28.1)	20
Base pelvic fin - anal fin origin	28.0	26.9 (23.7-33.2)	25

Description. The principal meristic and morphometric characters are shown in Table 14. Body compact with blunt, fleshy snout; fishes mature at about 45 mm SL. Head with scale patch on cheek containing 5–6 scale rows on upper cheek, 4–7 (rarely 3) scales on operculum above opercular spine in two rows. Horizontal diameter of scales on body about 1.2% SL. Maxillaries expanded posteriorly with prominent angle at rear ventral corner. Anterior nostril low on snout, 1/3 distance from tip of snout to anterior margin

Fig. 30. *Diancistrus fuscus* (Fowler, 1946). Holotype. ANSP 72070, male, 60 mm SL.

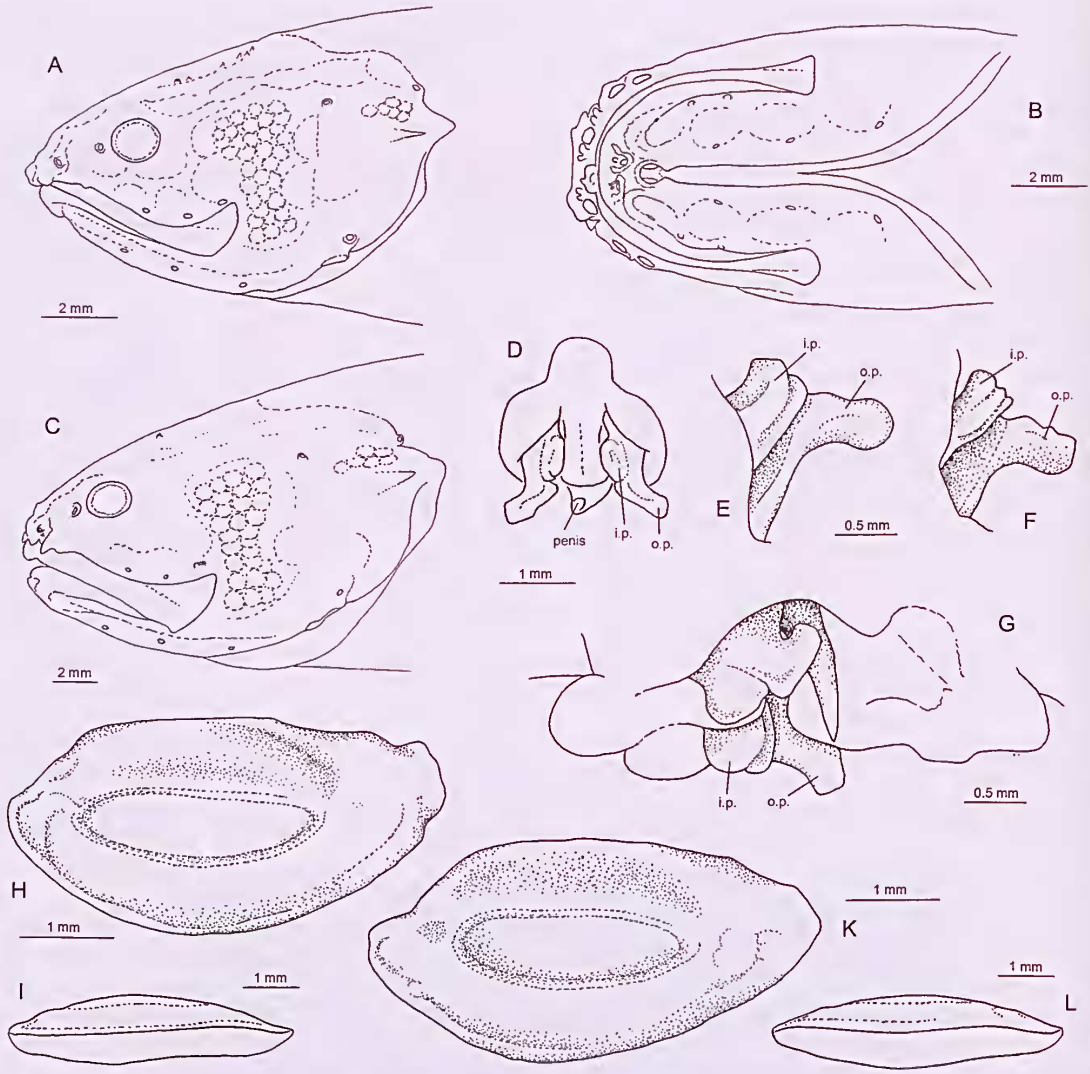

Fig. 31. *Diancistrus fuscus* (Fowler, 1946). **A**, lateral view of head, YCM-P 36436, female, 62 mm SL; **B**, ventral view of head, YCM-P 36596, female, 48 mm SL; **C**, Lateral view of head, USNM 372960, male, 67 mm SL; **D**, ventral view of male copulatory organ, USNM 384596, 56 mm SL; **E**, view of left pseudoclasper from inside, USNM 384596, 56 mm SL; **F**, view of left pseudoclasper from inside, USNM 384595, 47 mm SL; **G**, inclined lateral view of male copulatory organ, USNM 384596, 56 mm SL; **H**, median view of right otolith, USNM 372960, male, 66 mm SL; **I**, ventral view of right otolith, USNM 372960, male, 66 mm SL; **K**, median view of right otolith, NSMT P. 49441, female, 62 mm SL; **L**, ventral view of right otolith, NSMT P. 49441, female, 62 mm SL.

of eye. Posterior nostril small, the size of anterior nostril and about 1/6–1/8 the size of eye.

Head sensory pores (Fig. 31 A-C). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of a 60 mm SL, male non-type – USNM 374177). Premaxilla with 4 rows of granular and 1 row of larger teeth at symphysis, followed by 5 rows of granular teeth posteriorly. Largest teeth up to 1/4 pupil diameter. Vomer horseshoe-shaped, with 3 tooth rows, posterior row with larger teeth. Palatine teeth in 3 rows anteriorly and 2 rows posteriorly, slightly larger on inner row. Dentary with 5 outer granular tooth rows and 1 inner row of larger teeth anteriorly, blending into 1 row of about 6 large fangs posteriorly, which are up to about 2/3 of pupil diameter.

Otolith (Fig. 31 H-L). Elongate, length to height 2.0–2.1 (47–67 mm SL); otolith length to sulcus length 1.8–2.0; sulcus not inclined. Posterior tip of otolith broad. Dorsal rim flat in otoliths of males, gently curved without postdorsal angle in otoliths of females. Otoliths of females more thickset than those of males. This subtle sexual dimorphism is opposite to the trend observed in most other species of the genus *Diancistrus*.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–8 (9) depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10 (11). First anal fin pterygiophore elongated, almost reaching tip of last preeaudal parapophysis in males, shorter in females.

Male copulatory organ (Fig. 31 D-G). Two pairs of large pseudoclaspers. Outer pseudoclasper with hook-shaped extension oriented backward at 90° angle and slightly bent outwards and with rounded tip; inner pseudoclasper short, joined to outer pseudoclasper anteriorly, with supporter, with small hook and wide thin flap at its base. Isthmus between pseudoclaspers narrow. Penis long, rather straight, with broad base and thin tip.

Coloration. Live colour brown (according to Fowler 1946); specimen photographed by J. T. Williams (USNM 372960) dark brown with translucent fins, light yellow at base. Uniformly medium to dark brown when preserved.

Comparison. *Diancistrus fuscus* belongs to the large group of species with hook- or stick-shaped outer pseudoclaspers, which further contains the species *D. alleni, D. beateae, D. leisi* n. sp., *D. longifilis, D. machidai* n. sp., *D. manciporus* n. sp., *D. novaeguineae, D. springeri* n. sp. and *D. vietnamensis* n. sp. Of those, *D. beateae* is readily distinguished by the complete scale coverage on the operculum, whereas *D. leisi* n. sp., *D. longifilis* and *D. manciporus* n. sp. lack scales on the operculum. *Diancistrus machidai* n. sp. has specimens without, or with only 1 or 2, scales above the opercular spine, but is distinguished by the lower number of dorsal fin rays (66–77 versus 74–85, usually 77–84), the lower number of vertebrae (40–43 versus 43–45), the straight outer pseudoclasper (versus slightly bent outwards) and the inner pseudoclasper being narrow and pointed (versus short and with small hook). *Diancistrus leisi* n. sp. and *D. springeri* n. sp. differ in the straight, stick-like outer pseudoclasper. *Diancistrus alleni, D. novaeguineae* and *D. vietnamensis* n. sp. are the species closest to *D. fuscus*. Of these *D. novaeguineae* is recognized by the broad, fleshy appendix of the inner pseudoclasper and generally larger number of scales above the opercular spine (7–16 versus 3–7). *Diancistrus fuscus, D. alleni* and *D. vietnamensis* n. sp. all share the same pseudoclasper pattern. *Diancistrus alleni* differs from the other two in the smaller number of scales above the opercular spine (1–2, rarely 3 versus 3–7). Finally, *D. fuscus* differs from *D. vietnamensis* n. sp. in the usually higher number of dorsal fin rays (74–85 versus 69–80), the D/V (6, rarely 7 versus 7), the head profile (low versus high neck) and the relative sulcus length (otolith length to sulcus length ≤2.0 versus >2.3).

At the Ryukyu Islands and northern Philippines *D. fuscus* co-occurs with two small-eyed species, *D. erythraeus* and *D. jackrandalli* n. sp., and at the northern Philippines also with *D. karinae* n. sp., which is readily distinguished by its continuous scale patch above and below the opercular spine. Possibly there is yet another *Diancistrus* species at the Ryukyu Islands (mentioned later as *Diancistrus* sp. 1).

Distribution (Fig. 57). *Diancistrus fuscus* is known from the Ryukyu Islands in the north and Taiwan to the northern Philippines southward to approximately 10°N. Further to the south, across the equator, *D. fuscus* is replaced by *D. alleni*. In the west along Hainan and northern Vietnam it is replaced by *D. vietnamensis* n. sp.

Remarks. *'Brotulina fusca'* is used as a trade name in the aquarium industry. Specimens purchased from vendors and said to be from Bali have proven to belong to *D. altidorsalis* (see respective account).

Diancistrus jackrandalli n. sp.

(Figs 29, 32, 33; Table 15)

Material examined. (3 specimens, 51–62 mm SL). Holotype – BPBM 40213, male, 51 mm SL, Ishigaki-jima, Ryukyu Islands, reef about 1/2 mile off harbour of Ishigaki City; 20–35 feet, J.E. Randall and A.H Banner, 22 May 1968. Paratypes – BPBM 40214, 1 female, 51 mm SL, same data as holotype; YMC-P 34215, 1 female, 62 mm SL, Kakeroma Island, Amami Islands, northern Ryukyu Islands.

Table 15. Meristie and morphometrie eharaeters of *Diancistrus jackrandalli* n. sp.

	Holotype BPBM 40213	Holotype + 2 paratypes	n
		Mean (range)	
Standard length in mm	51	54.7 (51-62)	3
Meristie eharaeters			
Dorsal fin rays	77	77.3 (76-79)	3
Anal fin rays	64	63.7 (60-67)	3
Pectoral fin rays	21	21	3
Precaudal vertebrae	11	11	3
Caudal vertebrae	30	29.7 (29-30)	3
Total vertebrae	41	40.7 (40-41)	3
Rakers on anterior gill areh	15	15.5 (15-16)	2
Pseudobranehial filaments	0	0.7 (0,2)	3
D/V	6	6.3 (6-7)	3
D/A	21	21.3 (21-22)	3
V/A	13	13.7 (13-14)	3
Morphometric eharacters in % of SL			
Head length	27.8	27.5 (26.9-28.0)	3
Head width	14.5	15.3 (14.5-16.1)	2
Head height	19.5	19.0 (18.6-19.5)	2
Upper jaw length	13.9	14.0 (13.4-14.7)	3
Maxillary height	4.9	4.7 (4.4-4.9)	2
Diameter of pigmented eye	1.6	1.8 (1.6-2.1)	3
Interorbital width	7.8	7.0 (5.5-7.8)	3
Postorbital length	20.5	20.0 (19.0-20.6)	3
Preanal length	49.1	50.7 (48.3-54.5)	3
Predorsal length	31.6	32.2 (31.5-33.4)	3
Body depth at origin of anal fin	20.5	20.2 (19.2-20.8)	3
Peetoral fin length	15.0	15.8 (14.9-17.4)	3
Pelvic fin length	26.6	25.1 (23.6-26.6)	2
Base pelvie fin - anal fin origin	28.8	27.5 (24.8-28.9)	3

Fig. 32. *Diancistrus jackrandalli* n. sp. Holotype. BPBM 40213, male, 51 mm SL.

Diagnosis. Vertebrae 11+29–30=40–41, dorsal fin rays 76–79, anal fin rays 60–67; eyes small (1.6–2.1% SL); outer pseudoclasper moderately large, wing- shaped, slightly bent outwards; inner pseudoclasper almost free, bifurcate, with stout hook-like anterior branch and broad flap-like posterior branch; scale patch on cheek with 6–7 rows of small scales on upper cheek, 2 large scales on operculum above opercular spine; head massive, broad; otolith length to height ratio 2.1. *Diancistrus jackrandalli* is the only species of the genus *Diancistrus*, which combines small eyes (≤2.1% SL) with presence of scales on the operculum.

Description. The principal meristic and morphometric characters are shown in Table 15. Body moderately compact, with massive head; fishes mature at more than 50 mm SL. Head with scale patch on cheek with 6–7 rows on the upper cheek, 2 large scales on operculum above opercular spine. Horizontal diameter of scales on body about 1.3% SL. Maxillaries expanded posteriorly with prominent angle at rear ventral corner. Anterior nostril low on snout, 1/3 distance from tip of snout to anterior margin of eye. Posterior nostril very small, the size of anterior nostril and about 1/8 the size of eye.

Head sensory pores (Fig. 33 A). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 4 rows of granular teeth and 1 row of larger teeth at symphysis, followed by 4 rows of granular teeth posteriorly. Anteriormost large teeth about 1/3 of pupil diameter. Vomer horseshoe-shaped, with 4 tooth rows anteriorly, and 1 row posteriorly. Teeth of equal size. Palatine teeth in 3 rows anteriorly and 2 rows posteriorly. Teeth of equal size. Dentary with 2 outer rows of granular teeth and 2 inner rows of larger teeth anteriorly, blending into 1 row of 11 large fangs posteriorly, fangs up to about 1/2 pupil diameter.

Otolith (Fig. 33 B). Moderately elongate with pointed anterior and expanded posterior tips, length to height 2.1 (51 mm SL); otolith length to sulcus length 2.1; sulcus

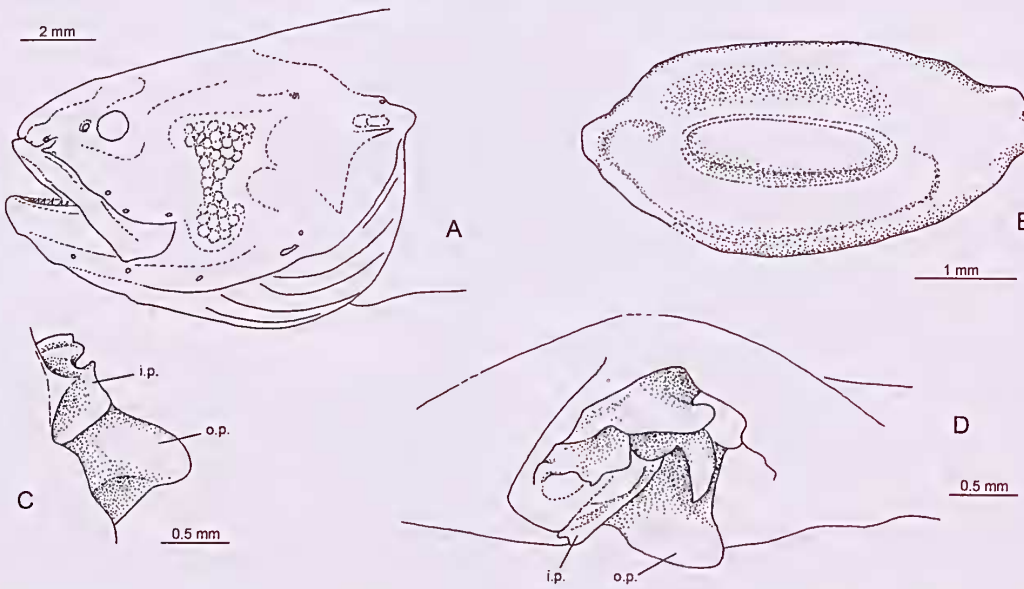

Fig. 33. *Diancistrus jackrandalli* n. sp. **A**, lateral view of head, holotype; **B**, median view of right otolith, YMC 34215, female, 62 mm SL; **C**, view of left pseudoclasper from inside, holotype; **D**, inclined lateral view of male copulatory organ, holotype.

slightly inclined at 5°. Dorsal rim with shallow postdorsal area.

Axial skeleton (of holotype). Neural spine of vertebrae 4 inclined and 5–9 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10 (11). First anal fin pterygiophore slightly elongated, not reaching tip of last preeaudal parapophysis.

Male copulatory organ (Fig. 33 C-D). Two pairs of moderately large pseudoclaspers. Outer wing-shaped, slightly bent outwards, with broad supporter; inner pseudoclasper almost free, bifureate, with stout hook-like anterior branch and broad flap-like posterior branch. Isthmus between pseudoclaspers wide. Penis short, curved, broad at base with slender tip.

Coloration. Live colour not known. Uniformly light brown when preserved.

Comparison. *Diancistrus jackrandalli* belongs to the small group of species with wing-shaped outer pseudoclaspers and bifureate inner pseudoclaspers, which include *D. alatus, D. brevirostris* and *D. fijiensis*. From these it is readily distinguished by the small eye (≤2.1% versus ≥2.2% SL), the presence of scales above the opercular spine (versus absent) and the bifureate but not spiny inner pseudoclaspers (versus spiny).

In the Ryukyu Islands, *D. jackrandalli* co-occurs with *D. erythraeus*, a small-eyed species with ear-lobe shaped outer pseudoclaspers, *D. fuscus* and an undescribed species, *Diancistrus* sp.1, which all belong to different species groups and are easily distinguished.

Distribution (Fig. 29). *Diancistrus jackrandalli* is only known from the Ryukyu Islands.

Etymology. Named in honor of John (Jack) E. Randall, Honolulu, BPBM, Hawaii, in recognition of his many contributions to ichthyology.

Diancistrus jeffjohnsoni n. sp.

(Figs 34, 35, 40; Table 16)

Material examined. (24 specimens, 37–79 mm SL). Holotype – QM I. 33769, male, 50 mm SL, 17°08'S, 139°36'E, Sweers Island, Gulf of Carpentaria, Australia, rocky reef with slabs of dead coral, large caves, brown algae at 2–3.5 m, J. Johnson and A. Gill, 15 Nov. 2002. Paratypes – AMS I. 24678-010, 3 males, 43–51 mm SL and 2 females, 48–59 mm SL, 12°25'S, 130°49'E, Darwin Harbour, Northern Territory, Australia, D.F. Hoese and S. Reader, 31 Aug. 1984; QM I. 33742, 1 male, 41 mm SL and 2 females, 49–79 mm SL, 16°38'S, 139°53'E, Mornington Island, Gulf of Carpentaria, Queensland, Australia, J. Johnson and A.C. Gill, 22 Nov. 2002; WAM P. 27967-005, 2 males, 43–60 mm SL and 1 female, 61 mm SL, 24°29'S, 113°25'E, Carnarvon, Western Australia, J.B. Hutchins *et al.*, 25 April 1983; WAM P. 27980-064, 1 male, 53 mm SL, 20°26'S, 115°35'E, Montebello Islands, Western Australia, G.R. Allen, 25 May 1983; WAM P. 30920-002, 1 male, 46 mm SL and 3 females, 41–49 mm SL, 15°59'S, 124°17'E, Heywood Islands, Western Australia, J.B. Hutchins, 22 Nov. 1994; WAM P. 31251-055, 1 male, 51 mm SL and 3 females, 57–59 mm SL, 15°55'S, 124°03'E, Montgomery Reef, Kimberley, Western Australia, S. Morrison, 3 Dec. 1996; WAM P. 31389-001, 1 female, 37 mm SL, 16°51'S, 122°40'E, Beagle Bay, Lacepede Islands, Western Australia, J.B. Hutchins, 27 Aug. 1997; ZMUC P 771478, 1 male, 44 mm SL and ZMUC P 771479,1 female, 60 mm SL, same data as WAM P. 27967-005.

Table 16. Meristic and morphometric characters of *Diancistrus jeffjohnsoni* n. sp.

	Holotype QM 33769	Holotype + 23 paratypes	n
		Mean (range)	
Standard length in mm	50	51.6 (37-79)	24
Meristic characters			
Dorsal fin rays	70	73.5 (70-77)	24
Anal fin rays	55	58.2 (55-63)	24
Pectoral fin rays	17	17.5 (17-18)	22
Precaudal vertebrae	12	11.9 (11-12)	24
Caudal vertebrae	31	31.3 (30-32)	24
Total vertebrae	43	43.2 (42-44)	24
Rakers on anterior gill arch	16	15.2 (14-17)	23
Pseudobranchial filaments	2	1.9 (1-2)	23
D/V	7	6.7 (6-7)	24
D/A	21	20.4 (19-23)	24
V/A	15	14.4 (14-15)	24
Morphometric characters in % of SL			
Head length	25.4	25.8 (24.6-26.9)	22
Head width	12.0	12.7 (11.4-14.7)	21
Head height	15.4	15.4 (14.3-17.3)	21
Upper jaw length	12.2	12.7 (12.2-13.4)	22
Maxillary height	4.1	4.1 (3.7-4.6)	22
Diameter of pigmented eye	3.0	2.7 (2.4-3.0)	23
Interorbital width	6.4	6.3 (5.6-7.1)	23
Postorbital length	18.7	18.8 (17.8-20.2)	21
Preanal length	50.6	49.9 (46.6-55.2)	23
Predorsal length	32.4	32.7 (29.1-35.0)	23
Body depth at origin of anal fin	17.4	17.0 (15.4-18.6)	23
Pectoral fin length	15.7	15.4 (13.3-16.7)	23
Pelvic fin length	24.5	24.2 (21.0-27.4)	21
Base pelvic fin - anal fin origin	-	30.0 (27.5-34.0)	21

Diagnosis. Vertebrae (11–) 12+ 30–32=42–44, dorsal fin rays 70–77, anal fin rays 55–63; eyes moderately large (2.4–3.0% SL), D/V 6–7; outer pseudoclasper large, twice the length of the inner pseudoclasper, wing-shaped, with narrow base, flat and its posterior part strongly bent backward; inner pseudoclasper almost completely joined to outer pseudoclasper anteriorly, thin, small, with single tip, not extending over anterior part of outer pseudoclasper; narrow scale patch on cheek with 3–5 scale rows on upper cheek, single large scale on opercular above opercular spine, usually covered by mucus and skin; head slender, elongate (head depth 14–17% SL); 1st and 2nd lower preopercular pore with separate opening (not fused as in all other species of the genus); otolith slender, length to height ratio 2.2–2.3, otolith length to sulcus length 2.2–2.4, dorsal rim regularly curved without angles.

Fig. 34. *Diancistrus jeffjohnsoni* n. sp. Holotype. QM 33769, male, 50 mm SL.

Description. The principal meristic and morphometric characters are shown in Table 16. Body and head slender, snout pointed; fishes mature at about 40–45 mm SL. Head with narrow scale patch on cheek with 3–5 scale rows on upper cheek, single large scale on operculum above opercular spine, usually covered by mucus and skin (seemingly a consistent character since no specimens with 0 or 2 such scales has been found). Horizontal diameter of body scales 1.3% SL. Maxillaries expanded posteriorly with angle at rear ventral corner and sometimes a knob in front of rear angle. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril large, larger than anterior nostril and about 1/4 size of eye.

Head sensory pores (Fig. 35 A-B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior), the 2nd anterior mandibular pore unusually large, about twice the size of posterior mandibular pores. Preopercular pores 4 (3 lower and 1 upper); 1st and 2nd lower preopercular pores separated.

Dentition (of holotype). Premaxilla with 4 rows of granular teeth and 1 tooth row anteriorly, including a few fang-like teeth closest to symphysis, up to 1/2 pupil diameter. Five rows of granular teeth posteriorly. Vomer teeth in 2 rows, with a few fangs on inner row posteriorly. Palatine teeth in 2 rows, teeth on inner row about 1/3 of pupil diameter, more than twice as long as teeth on outer row. Dentary with 4 rows of granular teeth and 1 tooth row anteriorly, blending into one row of about 10 large, curved, fang-like teeth posteriorly, fangs more than 1/2 pupil diameter.

Otolith (Fig. 35 H). Elongate with pointed anterior and rounded posterior tip, length to height 2.2–2.3 (51–59

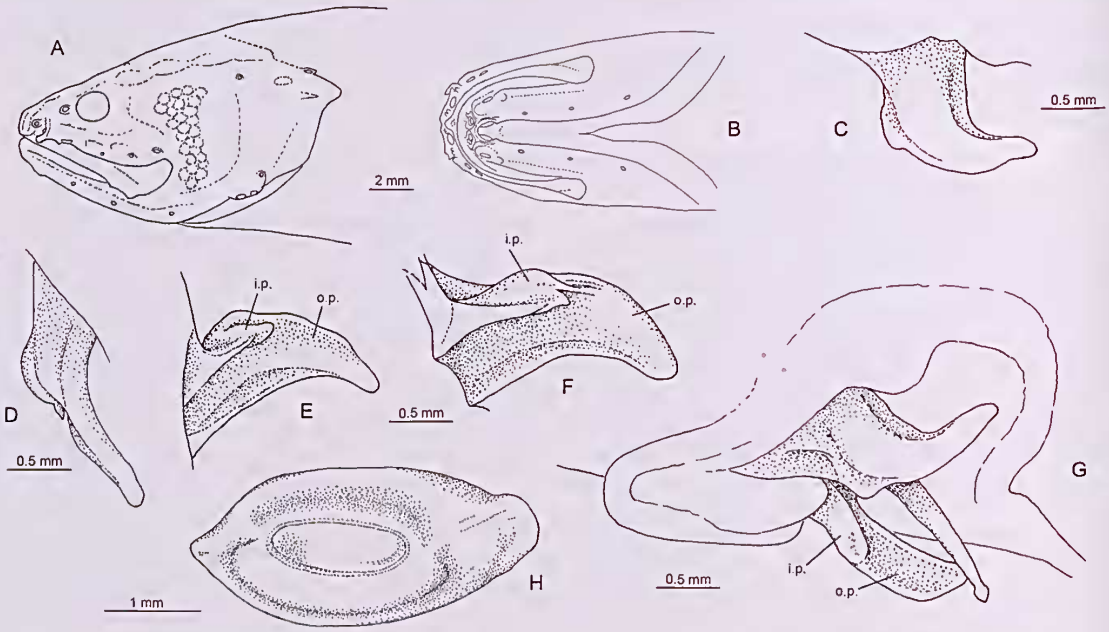

Fig. 35. *Diancistrus jeffjohnsoni* n. sp. **A**, lateral view of head, AMS I. 24678-010, male, 51 mm SL; **B**, ventral view of head, AMS I. 24678-010, male, 47 mm SL; **C**, view of left pseudoelasper from outside, WAM P. 31251-055, 51 mm SL; **D**, view of left pseudoelasper from ventral, WAM P. 31251-055, 51 mm SL; **E**, view of left pseudoelasper from inside, WAM P. 31251-055, 51 mm SL; **F**, view of left pseudoelasper from inside, holotype; **G**, inclined lateral view of male copulatory organ, WAM P. 31251-055, 51 mm SL; **H**, median view of right otolith, WAM P. 31251-055, 51 mm SL.

mm SL); otolith length to sulcus length 2.2–2.4; sulcus not inclined; dorsal rim regularly curved without angles, almost symmetrical to ventral rim.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–8 depressed. Parapophyses present from vertebra 7 to (11) 12. Pleural ribs on vertebrae 2–11. First anal fin pterygiophore elongated, reaching tip of last precaudal parapophysis in males, slightly shorter in females.

Male copulatory organ (Fig. 35 C-G). Two pairs of large pseudoclaspers. Outer pseudoclasper long, twice the length of inner pseudoclasper, wing-shaped, with narrow base, flat, with posterior part strongly bent backward, its supporter slender and strongly curved following curvature of the outer pseudoclasper; inner pseudoclasper almost completely joined to outer pseudoclasper anteriorly, thin, small, with single tip, not extending over anterior part of outer pseudoclasper, with small, slender supporter. Isthmus between pseudoclaspers narrow. Penis long, rather straight, thin.

Coloration. Live colour unknown. Uniformly light brown or greyish when preserved.

Comparison. *Diancistrus jeffjohnsoni* belongs to the group with a wing-shaped outer pseudoclasper and a single-tipped inner pseudoclasper, which includes *D. eremitus, D. karinae* n. sp., *D. katrineae* n. sp., *D. mennei* n. sp. and *D. pohnpeiensis* n. sp. It is easily distinguished from these species by the characters listed in the diagnosis, particularly the single scale above the opercular spine or the low number of dorsal fin rays (≤77 versus >78). Its pseudoclasper pattern resembles best that of *D. karinae* n. sp. (see respective account). In fact, *D. jeffjohnsoni* is readily distinguished from all other *Diancistrus* species as being the only one with predominantly 12 precaudal vertebrae (versus 11, which also occurs, though rarely, in *D. jeffjohnsoni*). It is furthermore one of the few *Diancistrus* species that can be easily recognized by means of otoliths with their elongate shape and the regularly curved dorsal rim.

Distribution (Fig. 40). *Diancistrus jeffjohnsoni* is distributed along the northern coast of Australia, from 24°S, 113°E, just north of Shark Bay, Western Australia, to 17°S, 139°E, in the Gulf of Carpentaria, Queensland.

Etymology. Named in honour of Jeff Johnson, Queensland Museum, Brisbane, who has collected the holotype specimen.

Diancistrus karinae n. sp.

(Figs 36, 37, 40; Table 17)

Material examined. (16 specimens, 35–82 mm SL). Holotype – BPBM 36712, male, 64 mm SL, 01°N, 124°E, Manado, Bunaken, Sulawesi, Indonesia, base of drop off at 16 m, J.E. Randall, M. Severns and R.C. Pyle, 29 Oct. 1991. Paratypes – AMS I. 18677-019, 1 female, 82 mm SL, Philippines, J.D. Lewis, 1974; BPBM 9938, 2 females, 41–55 mm SL, 07°N, 134°E, Palau, J.E. Randall, A.R. Emery and P. Helfman, 22 April 1970; BPBM 28527, 1 female, 67 mm SL, Sumilon Isl. SE of Cebu, Philippines, J.E. Randall, M. Gawel and K.E. Carpenter 3 June 1981; BPBM 31454, 1 female, 62 mm SL, 07°N, 134°E, Palau, J.E. Randall and R.C. Pyle, 15 July 1986; ROM 55147, 1 female, 48 mm SL, 09°N, 123°E, Visayan Islands, Philippines, June 1988; USNM 224328, 1 male, 79 mm SL and 1 female, 35 mm SL, 06°56'N, 158°06'E, Pohnpei Island, Pohnpei State, Federated States of Micronesia, V.G. Springer *et al.*, 11 Sept. 1980; USNM 263661, 1 male, 75 mm SL and 1 female, 35 mm SL, 09°N, 118°E, Puerto Princesa, Palawan, Sulu Sea, Philippines, R.E. Schroeder and G. Hendler, 7 Aug. 1979; USNM 263682, 1 male, 56 mm SL, 01°33'S, 144°59'E, Hermit Island, Papua New Guinea, V.G. Springer *et al.*, 2 Nov. 1978; ZMUC P 771476, 1 male, 59 mm SL, same data as USNM 263682; ZMUC P 771477, 1 female, 75 mm SL, same data as USNM 263661.

Additional specimens. USNM 366603, 1 female, 54 mm SL, 09°31'N, 123°40'E, Bohol Island, Philippines; USNM 366680, 1 female, 47 mm SL, 09°N, 118°E, Puerto Princesa, Palawan, Philippines.

Diagnosis. Vertebrae 11–12+32–35=43–46, dorsal fin rays 78–83, anal fin rays 61–68; eyes very large (2.7–3.8% SL), D/V 7; outer pseudoclasper large, about 1 1/2 length of inner pseudoclasper, wing-shaped, flat and its posterior

Table 17. Meristic and morphometric characters of *Diancistrus karinae* n. sp.

	Holotype BPBM 36712	Holotype + 13 paratypes	n
		Mean (range)	
Standard length in mm	61	58.1 (35-82)	14
Meristic characters			
Dorsal fin rays	80	80.6 (78-83)	13
Anal fin rays	64	64.3 (61-68)	13
Pectoral fin rays	19	18.9 (18-21)	14
Precaudal vertebrae	11	11.1 (11-12)	13
Caudal vertebrae	34	33.4 (31-35)	13
Total vertebrae	45	44.5 (43-46)	13
Rakers on anterior gill arch	13	15.3 (13-17)	14
Pseudobranchial filaments	2	2	13
D/V	7	7	13
D/A	19	19.6 (18.0-21.0)	13
V/A	14	13.2 (13.0-14.0)	13
Morphometric characters in % of SL			
Head length	27.8	27.0 (25.4-29.1)	14
Head width	15.8	14.1 (11.1-16.8)	13
Head height	16.7	16.9 (15.7-18.8)	13
Upper jaw length	14.2	13.2 (12.3-14.2)	14
Maxillary height	5.0	4.6 (4.0-5.1)	13
Diameter of pigmented eye	3.1	3.1 (2.7-3.8)	14
Interorbital width	7.4	6.9 (6.0-7.5)	13
Postorbital length	19.6	19.3 (18.0-21.2)	13
Preanal length	48.9	47.4 (43.3-51.4)	14
Predorsal length	35.5	34.3 (31.9-35.6)	14
Body depth at origin of anal fin	20.3	18.7 (16.4-20.4)	13
Pectoral fin length	17.9	16.7 (13.3-19.6)	14
Pelvic fin length	22.9	23.3 (21.6-25.1)	11
Base pelvic fin - anal fin origin	28.6	27.7 (23.2-31.3)	14

Fig. 36. *Diancistrus karinae* n. sp. Holotype. BPBM 36712, male, 64 mm SL.

part strongly bent backward; inner pseudoclasper joined to outer pseudoclasper anteriorly, long, single-pointed tip strongly extending over anterior part of inner pseudoclasper; scale patch on cheek with 5–6 scale rows on upper cheek, large scale patch on operculum continuous above and below opercular spine; head high, usually high-necked; otolith length to height ratio 2.0–2.1.

Description. The principal meristic and morphometric characters are shown in Table 17. Body moderately compact, often high-necked, highest near origin of dorsal fin; fishes large, mature at about 50 to 55 mm SL. Head with moderately broad scale patch on cheek with 5–6 scale rows on upper cheek, large scale patch on operculum forming a continuous patch above and below opercular spine. Horizontal diameter of body scales 2.2% SL. Maxillaries expanded posteriorly with prominent angle at rear ventral corner. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril small, the size of anterior nostril and about 1/5 the size of eye.

Head sensory pores (Fig. 37 A-B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 5 rows of granular teeth and 2 tooth rows anteriorly, including a few fang-like teeth closest to symphysis, up to 1/2 pupil diameter. Five granular rows of teeth posteriorly. Vomer teeth in 2 rows, with 2–3 fangs on inner row posteriorly. Palatine teeth in 2 rows, teeth on inner row about 1/3 of pupil diameter, more than twice that of teeth on outer row. Dentary with 4 granular rows and 2 tooth rows anterior, blending into one row of about 10 large, curved, fang-like teeth posteriorly, fang size more than 1/2 pupil diameter.

Otolith (Fig. 37 G-I). Moderately elongate with rounded anterior and expanded posterior tips, length to height 2.0–2.1 (64–79 mm SL); otolith length to sulcus length 2.0–2.1; sulcus slightly inclined at 5°. Broad and rounded postdorsal angle in otoliths of males, no postdorsal angle and gently curved dorsal rim otoliths of females. Otoliths of males are slightly thicker than those of females.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–9 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–11. First anal fin pterygiophore elongated, reaching tip of last precaudal parapophysis in males, slightly shorter in females.

Male copulatory organ (Fig. 37 C-F). Two pairs of large pseudoclaspers. Outer pseudoclasper long, about 1 ½ length of inner pseudoclasper, wing-shaped, with narrow base, flat and its posterior part strongly bent backward, its supporter slender and strongly curved with curvature of outer pseudoclasper; inner pseudoclasper joined to outer pseudoclasper anteriorly, long, single-pointed tip strongly extending over anterior part of outer pseudoclasper, with large supporter. Isthmus between pseudoclaspers wide. Penis long, curved, thin.

Coloration. Live colour reddish brown. Uniformly light brown when preserved.

Comparison. *Diancistrus karinae* belongs to the group with wing-shaped outer pseudoclasper and a single-tipped inner pseudoclasper, which includes *D. jeffjohnsoni, D. katrineae* n. sp., *D. eremitus, D. mennei* n. sp. and *D. pohnpeiensis* n. sp. In Pohnpei it co-occurs with *D. pohnpeiensis* n. sp. and in Hermit Island with *D. eremitus*, but is distinguishable by its complete coverage of scales on the operculum above and below the opercular spine. The shape of the flat outer pseudoclasper with the slender, strongly backward curved supporter resembles best that of *D. jeffjohnsoni,* but the pseudoclaspers of *D. karinae* are characterized by a rather strong and long inner pseudoclasper.

Together with *D. beateae, D. karinae* is the only species of the genus *Diancistrus* with a continuous scale patch on the operculum above and below the opercular spine. *Diancistrus karinae* differs in the pseudoclasper morphology (flat wing-shaped versus broad hook-shaped), the smaller number of dorsal fin rays (78–83 versus 84–91) and the higher D/V (7 versus 6). It is possible that the distribution ranges of the two species overlap marginally, but even then female specimens of the two species can be distinguished by the dorsal fin ray counts.

Distribution (Fig. 40). *Diancistrus karinae* is widely distributed in the northern West Pacific, from Palawan and the Visayan Islands of the northern Philippines to the northern tip of Sulawesi in the west and to the oceanic islands Palau, Pohnpei and Hermit Island in the east.

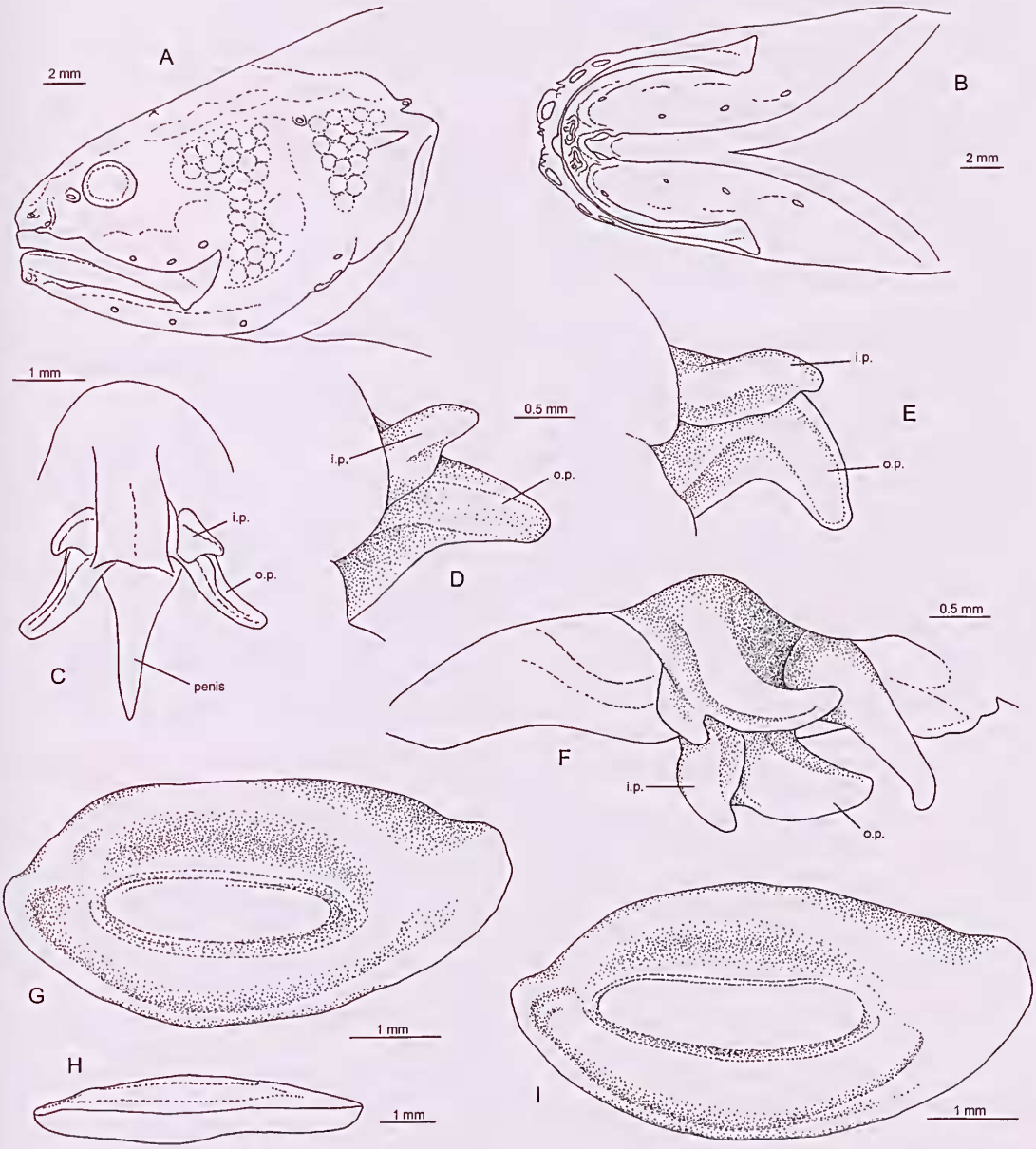

Fig. 37. *Diancistrus karinae* n. sp. **A**, lateral view of head, USNM 263682, male, 69 mm SL; **B**, ventral view of head, USNM 263682, male, 69 mm SL; **C**, ventral view of male copulatory organ, USNM 224328, 79 mm SL; **D**, view of left pseudoclasper from inside, USNM 224328, 79 mm SL; **E**, view of left pseudoclasper from inside, holotype; **F**, inclined lateral view of male copulatory organ, holotype; **G**, median view of right otolith, USNM 224328, male, 79 mm SL; **H**, ventral view of right otolith, USNM 224328, male, 79 mm SL; **I**, median view of right otolith, AMS I. 18677-019, female, 82 mm SL.

Etymology. Named after Karin Bloch for her most valuable support of her husband Jørgen Nielsen during his many hours invested in this study.

Diancistrus katrineae n. sp.

(Figs 38, 39, 40; Table 18)

Material examined. (16 specimens, 36–102 mm SL). Holotype – BPBM 40215, male, 71 mm SL, 27°S, 144°W, Katrineae, SW side of Kakatrineaeo Iti, Tubuai Islands, French Polynesia, 20 m in cave, J.E. Randall and D. Bryant, 16 Feb. 1971. Paratypes – AMS I. 253780-008, 1 female, 59 mm SL, 14°53'S, 148°43'E, Matahiva, Huahine, Tubuai Islands, French Polynesia, J. Bell, 1983; AMS I. 28950-064, 1 male, 49 mm SL and 1 female, 49 mm SL, 17°29'S, 149°51'W, Moorea, Tahiti, Society Islands, French Polynesia, T. Trnski, A. Lefevre and R. Galzin, 22 Feb.

1989; BPBM 6093, 1 male, 76 mm SL, 17°S, 149°W, Tahiti, Society Islands, French Polynesia, J.E.Randall, Walters, D. Devaney and Richert, 4 Sept. 1967; BPBM 8358, 1 female, 46 mm SL, Papote Bay, Tahiti, Society Islands, French Polynesia, J.E.Randall and Adam, 6 March 1969; BPBM 9935, 2 females, 36–41 mm SL, Tahiti, J.E. Randall, 11 March 1964; BPBM 13934, 2 females, 42–78 mm SL, 21°S, 159°W, Rarotonga, Cook Islands, J.E. Randall and D.B. Cannoy, 10 March 1971; BPBM 17291, 1 male, 102 mm SL and 2 females, 51–72 mm SL, same data as holotype; ZMUC P 771480, 1 female, 56 mm SL, same data as BPBM 13934.

Tentatively assigned specimens: BPBM 12274, 1 female, 81 mm SL, 24°S, 124°W, Ducie Atoll, Pitcairn Islands, J.E. Randall, Costello, D.B. Cannoy and S. Christian, 15 Jan. 1971; BPBM 40216, 1 female, 48 mm SL, 24°S, 124°W, Ducie Atoll, Pitcairn Islands, J.E. Randall, Costello, D.B. Cannoy and S. Christian, 14 Jan. 1971.

Diagnosis. Vertebrae 11–12+33–35=44–46, dorsal fin rays 78–86, anal fin rays 63–69; eyes large (2.0–3.1% SL), D/V 6; outer pseudoclasper large, broad, wing-shaped, with concave inner face; inner pseudoclasper joined to outer pseudoclasper anteriorly, thin, with narrow base and single-pointed tip extending over anterior part of outer pseudoclasper; moderately broad scale patch on cheek with 5–8 scale rows, large scale patch on operculum above opercular spine (13–21 scales) and separated smaller scale patch below opercular spine (3–7 scales); head massive, thick.

Description. The principal meristic and morphometric characters are shown in Table 18. Body moderately compact, with massive fleshy snout; fishes large, mature at about 50 mm SL. Head with moderately broad scale patch on cheek with 5–8 scales rows on upper cheek, large scale patch on operculum above opercular spine (13–21 scales) and separated smaller scale patch below opercular spine (3–7 scales). Horizontal diameter of body scales 2.0% SL. Maxillaries expanded posteriorly with distinct knob at rear ventral corner. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril small, slightly larger than anterior nostril and about 1/5 the size of eye.

Head sensory pores (Fig. 39 A-D). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Table 18. Meristic and morphometric characters of *Diancistrus katrineae* n. sp.

	Holotype BPBM 40215	Holotype + 13 paratypes Mean (range)	N
Standard length in mm	71	59.1 (36-102)	
Meristic characters			
Dorsal fin rays	85	82.6 (78-86)	14
Anal fin rays	67	66.4 (63-69)	14
Pectoral fin rays	22	20.8 (20-22)	11
Preeaudal vertebrae	11	11.1 (11-12)	14
Caudal vertebrae	34	33.7 (33-35)	14
Total vertebrae	45	44.8 (44-46)	14
Rakers on anterior gill arch	17	16.0 (14-17)	13
Pseudobranchial filaments	2	2	14
D/V	6	6.1 (6-7)	14
D/A	22	21.1 (18-24)	14
V/A	14	13.4 (13-14)	14
Morphometric characters in % of SL			
Head length	27.7	27.1 (24.9-28.2)	14
Head width	13.8	14.2 (11.8-18.6)	12
Head height	17.8	19.3 (16.7-21.8)	13
Upper jaw length	14.3	13.1 (12.0-14.3)	14
Maxillary height	5.3	4.8 (3.9-5.3)	12
Diameter of pigmented eye	2.6	2.7 (2.0-3.1)	14
Interorbital width	7.2	5.7 (4.3-7.2)	14
Postorbital length	20.0	19.5 (16.7-20.4)	13
Preanal length	46.3	47.6 (44.9-51.2)	14
Predorsal length	33.4	32.3 (28.0-34.2)	11
Body depth at origin of anal fin	20.2	18.7 (15.5-21.4)	13
Pectoral fin length	16.0	16.1 (12.9-18.6)	12
Pelvic fin length	26.2	23.8 (19.5-27.6)	10
Base pelvic fin - anal fin origin	26.5	26.2 (20.7-31.2)	14

Dentition (of holotype). Premaxilla with 6 rows of granular teeth and 2 rows of larger teeth at symphysis, followed by 7 rows of granular teeth posteriorly. Vomer horseshoe-shaped, with 3 rows of teeth, with teeth in inner row only slightly larger than outer rows. Palatine teeth in 3 rows of similar sized teeth. Dentary with 5 outer rows of granular teeth and 1 inner row of larger teeth anteriorly blending into 1 row of about 10 large fangs posteriorly, fang size up to about 1/3 of pupil diameter.

Otolith (Fig. 39 G–I). Moderately elongate with almost symmetrically pointed anterior and posterior tip, length to height 2.0 (49–81 mm SL); otolith length to sulcus length 2.1; sulcus slightly inclined at 5°.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 5–8 depressed. Parapophyses present

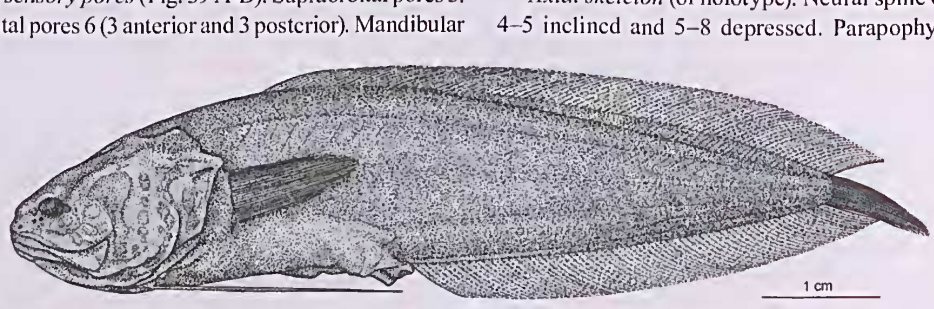

Fig. 38. *Diancistrus katrineae* n. sp. Holotype. BPBM 40215, male, 71 mm SL.

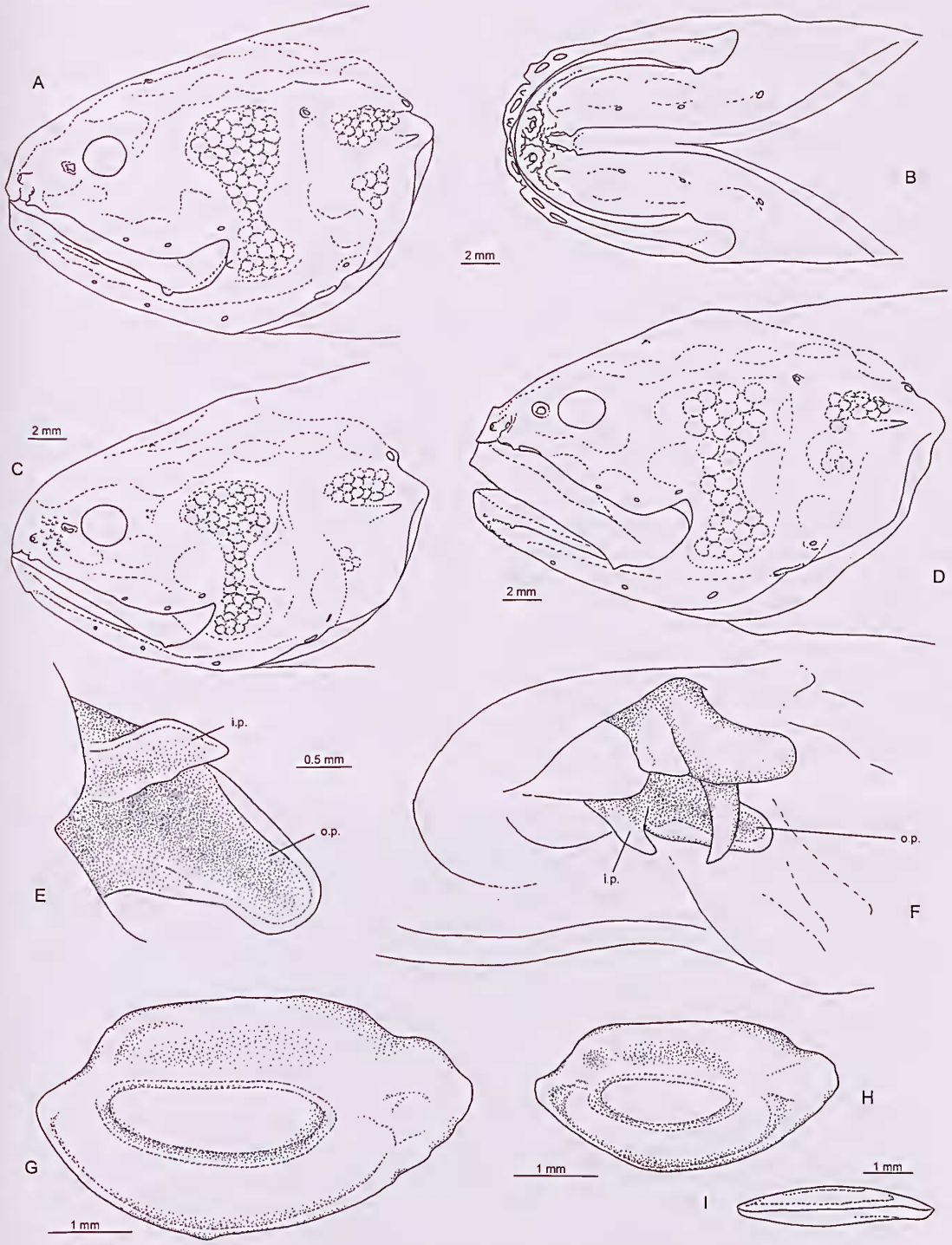

Fig. 39. *Diancistrus katrineae* n. sp. **A**, lateral view of head, BPBM 6093, male, 76 mm SL; **B**, ventral view of head, BPBM 6093, male, 76 mm SL; **C**, lateral view of head, holotype; **D**, lateral view of head, BPBM 12274, tentatively assigned female, 81 mm SL; **E**, view of left pseudoclasper from inside, BPBM 17291, male, 102 mm SL; **F**, inclined lateral view of male copulatory organ, BPBM 17291, male, 102 mm SL; **G**, median view of right otolith, BPBM 12274, tentatively assigned female, 81 mm SL; **H**, median view of right otolith, AMS I. 28950-064, male, 49 mm SL; **I**, ventral view of right otolith, AMS I. 28950-064, male, 49 mm SL.

from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, mostly reaching near to tip of last precaudal parapophysis.

Male copulatory organ (Fig. 39 E-F). Two pairs of pseudoclaspers. Outer pseudoclasper large, wing-shaped, with concave inner face, with broad base and broad supporter; inner pseudoclasper small joined to outer pseudoclasper anteriorly, thin, with narrow base and single pointed tip extending over anterior part of outer pseudoclasper, with large supporter. Isthmus between pseudoclaspers moderately wide. Penis short, curved, thin.

Coloration. Live colour bright yellow to yellow-orange, yellowish grey in small specimens. Uniformly light brown when preserved.

Comparison. *Diancistrus katrineae* belongs to the subgroup characterized by a wing-shaped outer pseudoclasper and a single-tipped inner pseudoclasper. This subgroup includes *D. eremitus, D. jeffjohnsoni, D. karinae, D. mennei* n. sp. and *D. pohnpeiensis* n. sp. *Diancistrus katrineae* differs from these by having a scale patch above and one below the opercular spine on the operculum, and the concave inner face of the outer pseudoclasper. *Diancistrus karinae* has a continuous scale patch above and below the opercular spine, whereas the other species only have a single scale patch above the opercular spine. *Diancistrus katrineae* differs further from *D. karinae* in the more massive head and the lower D/V (6 versus 7). The only other species with separate scale patches above and below the opercular spine are *D. altidorsalis* with the high-necked head profile and the distinctly ear-lobe outer pseudoclasper, and, in rare instances, *D. novaeguineae*, which has hook-shaped outer pseudoclaspers, and, from the genus *Dinematichthys, Dinematichthys megasoma* Machida, 1994, occasionally in very large specimens.

In Tahiti, *D. katrineae* co-occurs with the small-eyed *D. tongaensis* n. sp. of the group with ear-lobe shaped outer pseudoclaspers. Also, there is evidence of a possible further species of the same (*D. katrineae*) subgroup from Rurutu, Tubuai Islands, mentioned later as *Diancistrus* sp. 2.

Remarks. *Diancistrus katrineae* shows certain regional differences, most obviously in head squamation: the 4 specimens from Tahiti and the 3 from the Cook Islands seem to have consistently more scales on the lower opercular scale patch (Fig. 39 A) than those from the Tubuai Islands (5 specimens, Fig. 39 C) and Ducie Atoll (2 specimens, Fig. 39 D) (6–7 versus 2–3). Specimens from Tahiti have smaller eyes (2.0–2.2% SL versus generally 2.5–3.1% SL). No other characters support these differences. The specimens from Ducie Atoll are further characterized by lesser and larger scales on the cheek (5–6 versus 7–8 scale rows on upper cheek) (Fig. 39 D) and a much more compressed otolith (length to height ratio 1.8 versus 2.0) (Fig. 39 G). Since only two females are known from Ducie Atoll they are only tentatively included.

Distribution (Fig. 40). *Diancistrus katrineae* is the most eastwardly distributed species of the genus, known from the Society Islands, the Cook and Tubuai Islands and reaching even as far as Ducie Atoll, Pitcairn Islands, the most isolated atoll in the south-eastern Pacific.

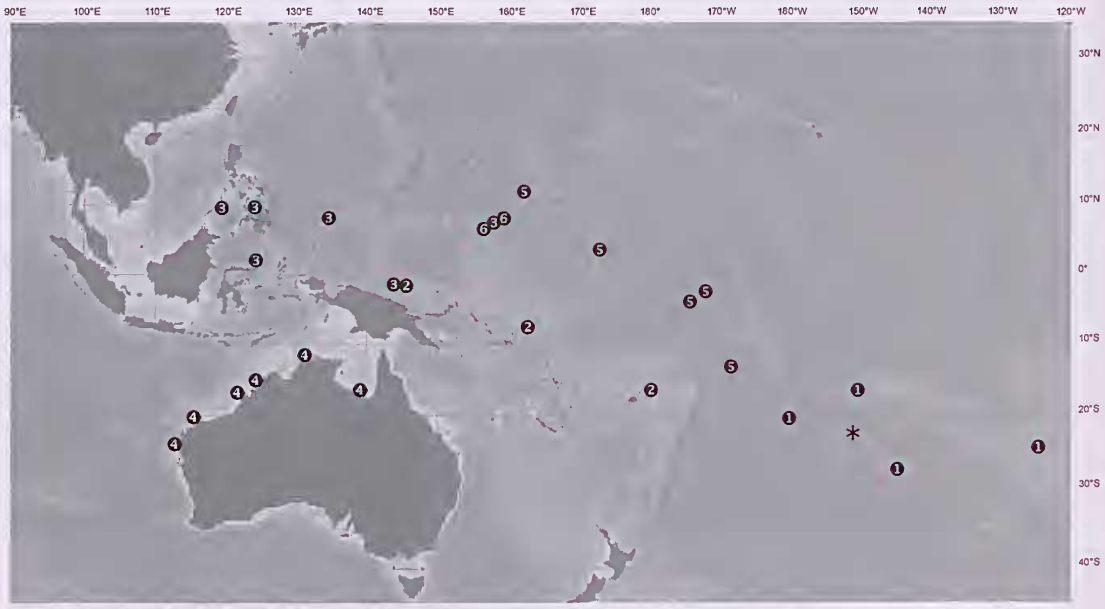

Fig. 40. Sample sites of *Diancistrus katrineae* n. sp., *D. eremitus* n. sp., *D. karinae* n. sp., *D. jeffjohnsoni* n. sp., *D. mennei* n. sp., *D. pohnpeiensis* n. sp. and *Diancistrus* sp. 2. One symbol may represent several samples.

Etymology. Named after Katrine Worsaae for her most valuable support of her husband Peter Rask Møller during his many hours invested in this study.

Diancistrus leisi n. sp.

(Figs 29, 41, 42; Table 19)

Material examined. (4 specimens, 33–46 mm SL). Holotype – AMS I. 33740-061, male, 33 mm SL, 10°S, 144°E, Ashmore Reef, NE end, 10°09.58'S 144°34.94'E, 1–2 m depth, FNQ party, 25 Jan. 1993. Paratypes – AMS I. 33740-062, 1 female, 46 mm SL, same data as holotype; AMS I. 33708-132, 1 female, 34 mm SL, Reef 10–418, Coral Sea 10°59.98'S 144°01.22'E, 2–9 m depth, FNQ team, 15 Jan. 1993; AMS I. 22582-020, 1 female, 52 mm SL, 15°49'S, 145°50'E, Cooktown area, Escape Reef North, outer barrier reef, Great Barrier Reef, Queensland, 14–17 m depth, AMS party, 29 Oct. 1981.

Diagnosis. Vertebrae 11+30=41, dorsal fin rays 69–73, anal fin rays 55–57; eyes small (1.7–1.9% SL), D/V 6; outer pseudoclasper short, only slightly longer than inner pseudoclasper, stick-shaped; inner pseudoclasper anteriorly joined to outer pseudoclasper, thin, spiny, strongly forward inclined; narrow scale patch on cheek with 3–4 scale rows on upper cheek and only 1–2 scale rows on lower cheek, no scales on operculum; head high, laterally strongly compressed, eye located high; otolith length to height ratio 2.0–2.1.

Description. The principal meristic and morphometric characters are shown in Table 19. Body slender, laterally compressed, with dorsally depressed head profile; fishes small, mature at about 30 mm SL. Head with narrow scale patch on cheek with 3–4 scale rows on upper cheek and only 1–2 scale rows on lower cheek, no scales on operculum. Horizontal diameter of body scales 1.2% SL. Maxillaries expanded posteriorly with angle at rear ventral corner. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril large, half-moon shaped due to large anterior flap, twice the size of anterior nostril and about 1/3 the size of eye.

Head sensory pores (Fig. 42 A-B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior), the 3rd posterior mandibular pore twice the size of the two other posterior mandibular pores. Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 4 rows of granular teeth and 1 tooth row anteriorly, including a few fang-like teeth closest to symphysis, up to ½ pupil diameter. Four rows of granular teeth posteriorly. Vomer teeth in 2 rows of equally sized teeth. Palatine teeth in 2 rows, teeth on inner row about 1/3 of pupil diameter, more than twice as long as teeth in outer row. Dentary with 4 rows of granular teeth and 2 tooth rows anteriorly, blending into one row of about 10 large, curved fang-like teeth posteriorly, size more than 1/2 pupil diameter.

Table 19. Meristic and morphometric characters of *Diancistrus leisi* n. sp.

	Holotype AMS I. 33740-061	Holotype + 3 paratypes Mean (range)	n
Standard length in mm	33	39.5 (33-46)	4
Meristic characters			
Dorsal fin rays	70	70.7 (69-73)	3
Anal fin rays	57	56.0 (55-57)	3
Pectoral fin rays	19	19.8 (19-21)	4
Precaudal vertebrae	11	11	3
Caudal vertebrae	30	30	3
Total vertebrae	41	41	3
Rakers on anterior gill arch	16	16.5 (16-18)	4
Pseudobranchial filaments	2	2	4
D/V	6	6	3
D/A	19	20.7 (19-22)	3
V/A	13	13.3 (13-14)	3
Morphometric characters in % of SL			
Head length	28.3	28.0 (26.5-29.8)	4
Head width	11.1	12.2 (11.1-13.8)	4
Head height	17.3	16.3 (15.1-17.3)	4
Upper jaw length	13.7	13.8 (13.3-14.6)	4
Maxillary height	4.2	4.2 (3.8-4.8)	4
Diameter of pigmented eye	1.7	1.8 (1.7-1.9)	4
Interorbital width	7.3	7.3 (6.9-7.6)	4
Postorbital length	21.1	21.2 (20.8-22.2)	4
Preanal length	46.5	46.1 (43.9-48.4)	4
Predorsal length	33.3	33.1 (31.4-34.0)	4
Body depth at origin of anal fin	16.9	17.1 (16.5-17.6)	4
Pectoral fin length	16.0	16.0 (14.4-18.0)	4
Pelvic fin length	27.1	27.2 (27.0-27.5)	4
Base pelvic fin - anal fin origin	27.1	27.1 (26.5-28.3)	4

Otolith (Fig. 42 E-F). Elongate with pointed anterior and posterior tips, length to height 2.0–2.1 (34–46 mm SL); otolith length to sulcus length 2.3–2.4; sulcus slightly inclined at 5°.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–8 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore slightly elongated, not reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 42 C-D). Two pairs of rather small pseudoclaspers. Outer pseudoclasper short, only slightly longer than inner pseudoclasper, stick-shaped; inner pseudoclasper anteriorly joined to outer pseudoclasper, thin, spiny, strongly forward inclined; both inner and outer pseudoclasper nearly reduced to their respective supporters. Isthmus between pseudoclaspers narrow. Penis moderately long, curved, thin.

Coloration. Live colour not known. Uniformly light brown when preserved.

Comparison. Within the large group of species with hook- or stick-shaped outer pseudoclaspers, *D. leisi* belongs to the small group with the stick-shaped ones, together with *D. springeri* n. sp., from which it differs in the smaller eyes

Fig. 41. *Diancistrus leisi* n. sp. Holotype. AMS I. 33740-061, male, 33 mm SL.

(<2.0% versus >2.5% SL), the absence of scales above the opercular spine (versus present), the narrow scale patch on the cheek (versus broad), the lower number of vertebrae (41 versus 44–45) and dorsal fin rays (69–73 versus 78–84) and the laterally strongly compressed head (versus not compressed). Besides the pseudoclasper pattern, the characteristic head squamation pattern, the laterally strongly compressed head and the dorsally shifted small eyes distinguish *D. leisi* from the many other *Diancistrus* species occurring along the reefs of the Coral Sea and the northern Great Barrier Reef.

Distribution (Fig. 29). *Diancistrus leisi* is known from a few specimens from offshore reefs in the Coral Sea and outer reefs of the northern part of the Great Barrier Reef, Queensland, Australia.

Ecology. The specimens were collected in the outer barrier reef at 2–17 m depth.

Etymology. Named in honour of Jeff Leis, Sydney, Australia, in recognition of his many contributions to the study of fish larvae.

Diancistrus longifilis Ogilby, 1899

(Figs 12, 43, 44; Table 20)

Diancistrus longifilis Ogilby, 1899: 744, figs 59–60 (type locality: Lord Howe Island, off eastern Australia).

Diancistrus longifilis – Paxton *et al.* 1989: 316; Nielsen *et al.* 1999: 129.

Material examined. (120 specimens, 19–77 mm SL). Holotype – QM-I 785, male, 76 mm SL, 31°S, 159°E, Lord Howe Island.

Further specimens. AMS IA. 2044, 1 male, 71 mm SL, 20°S, 148°E, Hayman Island, Great Barrier Reef, Queensland, Australia; AMS I. 17377-018, 2 males, 40–44 mm SL, 31°32'S, 159°04'E, Lord Howe Island, J.E. Randall, 24 Feb. 1973; AMS I. 17445-148, 3 males, 29–48 mm SL and 4 females, 42–63 mm SL, Capricorn Group, One Tree Island, Great Barrier Reef, Queensland, Australia, 23°30'S 152°05'E, F.H. Talbot and party, 19 Sep. 1968; AMS I. 19108-142, 1 female, 36 mm SL, 14°40'S, 145°28'E, Lizard Island, Queensland, Great Barrier Reef, 1–10 m depth, D.F. Hoese and party, 17 Nov. 1975; AMS I.

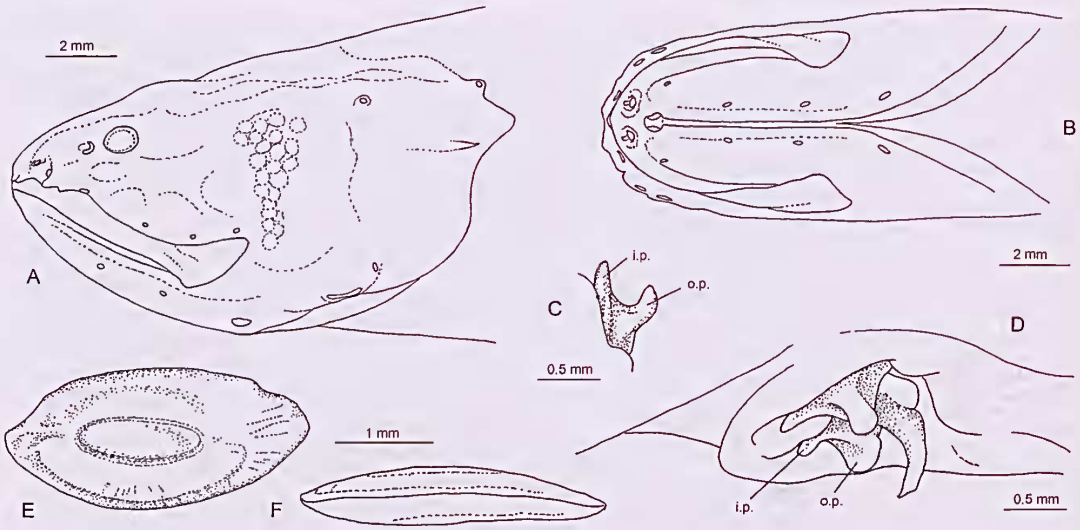

Fig. 42. *Diancistrus leisi* n. sp. **A**, lateral view of head, AMS I. 33740-062, female, 46 mm SL; **B**, ventral view of head, AMS I. 33740-062, female, 46 mm SL; **C**, view of left pseudoclasper from inside, holotype; **D**, inclined lateral view of male copulatory organ, holotype; **E**, median view of right otolith, AMS I. 33740-062, female, 46 mm SL; **F**, ventral view of right otolith, AMS I. 33740-062, female, 46 mm SL.

20201-043, 12 males, 45–76 mm SL and 3 females, 49–61 mm SL, 23°30'S, 152°05'E, Capricorn Group, One Tree Island, Great Barrier Reef, Queensland, Australia, 2 m depth, D.F. Hoese, 29 Sep. 1971; AMS I. 20208-004, 3 males, 37–58 mm SL and 1 female, 60 mm SL, 23°30'S, 152°05'E, Capricorn Group, One Tree Island, Great Barrier Reef, Queensland, Australia, D.F. Hoese, 27 Sept. 1971; AMS I. 20210-004, 3 males, 44–49 mm SL and 2 females, 48–53 mm SL, 23°30'S, 152°04'E, Capricorn Group, One Tree Island, lagoon, Great Barrier Reef, Queensland, Australia, F.H. Talbot and party, 5 Oct. 1971; AMS I. 20211-004, 2 females, 49 mm SL, 23°S, 152°E, Capricorn Group, One Tree Island, Great Barrier Reef, Queensland, Australia, F.H. Talbot and party, 5 Oct. 1971; AMS I. 20561-004, 5 specimens, 23°S, 152°E, Capricorn Group, One Tree Island, Great Barrier Reef, Queensland, Australia; AMS I. 21540-065, 1 male, 50 mm SL, 14°S, 145°E, Lizard Island, Eagle Cay, Great Barrier Reef, Queensland, Australia, 14°39'S 145°27'E, D.F. Hoese and H. Larson, 12 Feb. 1975; AMS I. 22583-019, 1 male, 52 mm SL and 1 female, 43 mm SL, 15°S, 145°E, Escape Reef, Great Barrier Reef; AMS I. 22633-103, 1 male, 40 mm SL and 2 females, 27–38 mm SL, 15°49'S, 145°50'E, Escape Reef, outer barrier reef, Great Barrier Reef, Queensland, Australia, 6 Nov. 1981; AMS I. 27138-048, 1 female, 52 mm SL, 29°27'S, 159°05'E, Middleton Reef, A.C. Gill and S. Reader, 5 Dec. 1987; AMS I. 27155-013, 2 males, 70–72 mm SL and 3 females, 57–65 mm SL, 29°56'S, 159°02'E, Elizabeth Reef, A.C. Gill, Cordall and Ledbitter, 11 Dec. 1987; AMS I. 34311-015, 1 male, 45 mm SL and 5 females, 37–54 mm SL, 22°14'S, 150°19'E, Collins Island, Cannibal Group, Great Barrier Reef, Queensland, Australia, 15 Sept. 1993; AMS I. 34311-016, 1 male, 41 mm SL and 3 females, 28–37 mm SL, 22°14'S, 150°19'E, Collins Island, Cannibal Group, Great Barrier Reef, Queensland, Australia, 15 Sept. 1993; BPBM 11419, 1 male, 69 mm SL, Noumea, outside of barrier reef, New Caledonia, J.E. Randall, P. Fourmanoir and R. Grandperrin, 14 Aug. 1971; BPBM 14943, 2 females, 63–69 mm SL, 31°S, 159°E, Lord Howe Island, J.E. Randall, B.C. Russell and B. Goldman, 26 Feb. 1973; BPBM 27168, 1 female, 50 mm SL, New Caledonia, Jan. 1979; MNHN 1980-0243, 1 male, 77 mm SL and 2 females, 35–66 mm SL, New Caledonia; MNHN 1980-0244, 2 males, 59–64 mm SL and 2 females, 27–37 mm SL, New Caledonia; MNHN 1980-0634, 1 female, 52 mm SL, New Caledonia; MNHN 1980-0695, 1 female, 62 mm SL, New Caledonia; SMNS 19829, 2 females, 63–64 mm SL, 21°35'45"S, 167°50'06"E, Cap Wabao, 150 m NNE of Cape, Baie de Tadin, 6 km SW Tadin, W coast, Maré Island, Loyalty Islands, crevices of coralline rock adjacent to a surge channel [high energy area] of a seaward fringing reef, 2–3.8 m depth , R. Fricke, 12 Nov. 1997; USNM 263714, 1 male, 57 mm SL and 1 female, 57 mm SL, 23°S, 152°E, Capricorn Group, One Tree Island, Great Barrier Reef, Queensland, Australia; USNM 263724, 2 males, 55–56 mm SL, 23°S, 152°E, Capricorn Group, One Tree Island, Great Barrier Reef, Queensland, Australia; USNM 366562, 3 males and 4 females, 29–55 mm SL, 23°S, 152°E, Capricorn Group, One Tree Island,

Table 20. Meristic and morphometric characters of *Diancistrus longifilis* Ogilby, 1899

	Holotype QM-I 785	Holotype + 119 specimens Mean (range)	n
Standard length in mm	76	53.6 (27-77)	69
Meristic characters			
Dorsal fin rays	83	81.2 (77-85)	36
Anal fin rays	65	64.8 (60-69)	36
Pectoral fin rays	20	19.1 (18-21)	22
Precaudal vertebrae	11	11	37
Caudal vertebrae	33	33.0 (32-35)	37
Total vertebrae	44	44.0 (43-46)	37
Rakers on anterior gill arch	14	15.2 (13.0-18.0)	30
Pseudobranchial filaments	2	2 (1-2)	26
D/V	7	6.4 (6-7)	37
D/A	22	21.6 (18.0-25.0)	37
V/A	14	13.6 (13.0-14.0)	38
Morphometric characters in % of SL			
Head length	26.3	26.5 (25.1-28.4)	30
Head width	17.1	13.2 (10.1-17.1)	31
Head height	17.1	16.0 (14.3-18.6)	31
Upper jaw length	13.7	13.1 (12.0-14.3)	30
Maxillary height	5.1	4.0 (3.5-5.1)	30
Diameter of pigmented eye	2.4	2.7 (2.4-3.2)	31
Interorbital width	7.3	6.7 (5.6-7.4)	31
Postorbital length	19.0	19.3 (18.0-20.5)	23
Preanal length	42.8	47.5 (42.4-52.2)	31
Predorsal length	33.6	32.0 (30.4-33.6)	31
Body depth at origin of anal fin	18.6	17.0 (14.0-18.6)	31
Pectoral fin length	16.2	15.5 (12.9-17.7)	31
Pelvic fin length	23.2	23.1 (21.0-25.5)	21
Base pelvic fin - anal fin origin	27.9	28.1 (22.0-33.2)	30

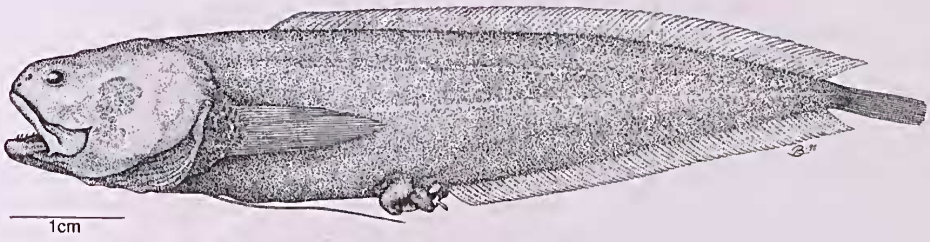

Fig. 43. *Diancistrus longifilis* Ogilby, 1899. Holotype. QM-I 785, male, 76 mm SL.

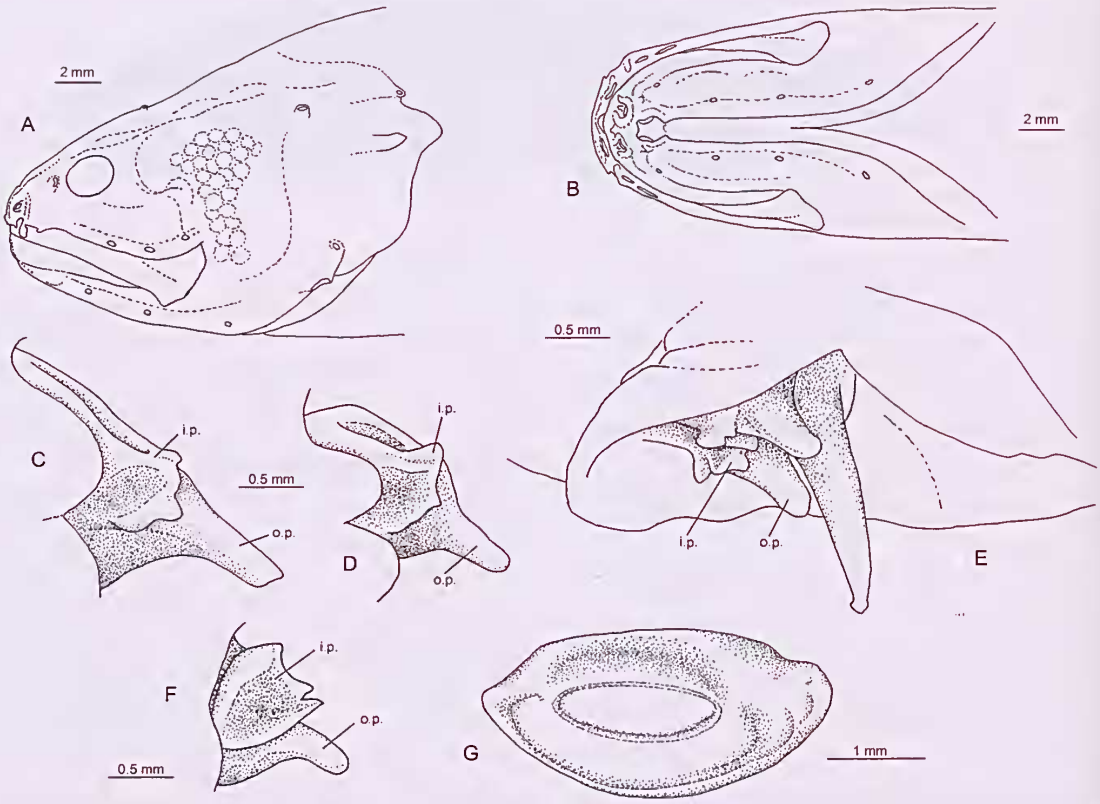

Fig. 44. *Diancistrus longifilis* Ogilby, 1899. **A**, lateral view of head, AMS I. 20201-043, male, 71 mm SL; **B**, ventral view of head, AMS I. 20201-043, male, 71 mm SL; **C**, view of left pseudoclasper from inside, MNHN 1980-0243, 77 mm SL; **D**, view of left pseudoclasper from inside, MNHN 1980-0244, 64 mm SL; **E**, inclined lateral view of male copulatory organ, MNHN 1980-0244, 59 mm SL; **F**, view of left pseudoclasper from inside, AMS I. 20201-043, male, 45 mm SL; **G**, median view of right otolith, WAM P. 29637-023, male, 46 mm SL.

Great Barrier Reef, Queensland, Australia; USNM 366586, 4 females, 42–55 mm SL, 23°S, 152°E, Capricorn Group, One Tree Island, Great Barrier Reef, Queensland, Australia; USNM 366588, 1 male and 3 females, 54–63 mm SL, 23°S, 152°E, Capricorn Group, One Tree Island, Great Barrier Reef, Queensland, Australia; USNM VGS 66–8, 2 males and 4 females, 50–63 mm SL, 23°S, 152°E, Capricorn Group, One Tree Island, Great Barrier Reef, Queensland, Australia; WAM P. 27065-001, 7 females, 19–59 mm SL, 24°46'S, 152°24'E, Bagara, Great Barrier Reef, Queensland, Australia, J.B. Hutchins, 3 Dec. 1980; WAM P. 29627-018, 1 male, 59 mm SL and 2 females, 31 mm SL, 16°31'S, 147°50'E, Holmes Reef, Coral Sea, G.R. Allen and M. Allen, 4 Nov. 1987; WAM P. 29637-023, 1 male, 46 mm SL and 2 females, 52–65 mm SL, 17°37'S, 151°26'E, Lihou Reef, Coral Sea, G.R. Allen *et al.*, 12 Nov. 1987; ZMUC P 771493, 1 male, 62 mm SL, same data as AMS I. 17377-018; ZMUC P 771492, 1 female, 49 mm SL, same data as AMS I. 19108-142.

Diagnosis. Vertebrae 11+32–35=43–46, dorsal fin rays 77–85, anal fin rays 60–69; outer pseudoclasper with long, sharply pointed hook-like extension, slightly bent outwards, and with thin supporter; inner pseudoclasper anteriorly connected to outer pseudoclasper, wide and concave due to broad thin flap; no scales on operculum (rarely a single scale above the opercular spine); upper preopercular pore present.

Description. The principal meristic and morphometric characters are shown in Table 20. Body slender with pointed snout; fishes mature at about 40 to 45 mm SL. Head with scale patch on cheek containing 5–9 scale rows on the upper cheek; no scales on operculum, except for very few specimens with a single scale above the opercular spine. Horizontal diameter of body scales 1.4% SL. Maxillaries expanded posteriorly with prominent angle at rear ventral corner. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril small, slightly larger than anterior nostril and about 1/5 the size of eye.

Head sensory pores (Fig. 44 A-B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 6 rows of granular teeth and 2 tooth rows anteriorly, including a few fang-like teeth closest to symphysis, up to 1/2 pupil diameter. Eight rows of granular teeth posteriorly. Vomer with 5 anterior rows of granular teeth and 1 inner row of larger teeth. Palatine teeth in 4 rows anteriorly and 2 rows posteriorly, largest on inner row. Dentary with 6 rows of granular teeth and 1 tooth row anteriorly, blending into one row of about 15 large, curved, fang-like teeth posteriorly, size more than 1/2 pupil diameter.

Otolith (Fig. 44 G). Moderately elongate, length to height 2.0–2.1 (46–65 mm SL); otolith length to sulcus length 2.0–2.1; sulcus inclined at an angle of 5°. Anterior tip of otolith pointed; posterior tip less pointed.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–9 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10 (11). First anal fin pterygiophore elongated, reaching tip of last precaudal parapophysis in males, somewhat shorter in females.

Male copulatory organ (Fig. 44 C-F). Two pairs of large pseudoclaspers. Outer pseudoclasper with long, sharply pointed and slightly bent outwards hook-like extension, with thin supporter; inner pseudoclasper anteriorly connected to outer pseudoclasper, wide and concave due to broad thin flap, sometimes with indication of furcation distally. Isthmus between pseudoclaspers narrow. Penis long, curved, thin.

Coloration. Live colour reported yellow or red. Uniformly light to medium brown when preserved.

Comparison. *Diancistrus longifilis* belongs to the group of species with hook- or stick-shaped outer pseudoclaspers, which includes *D. alleni, D. beateae, D. fuscus, D. leisi, D. machidai* n. sp., *D. manciporus* n. sp., *D. novaegmineae, D. springeri* n. sp. and *D. vietnamensis* n. sp. *Diancistrus longifilis* shares the absence of scales on the operculum with *D. leisi, D. machidai* n. sp. and *D. manciporus* n. sp. There are, however, very few undisputable male records of *D. longifilis* with a single scale above the opercular spine, an observation more regularly made also in *D. machidai* n. sp. Then, distinction of *D. longifilis* from *D. alleni* relies on the pseudoclasper pattern. Both species overlap in their geographical distribution along the northern Great Barrier Reef. While *D. machidai* n. sp. differs in several characters (see account), does *D. manciporus* n. sp. differs mainly in the lack of the upper preopercular pore (versus present).

Distribution (Fig. 12). *Diancistrus longifilis* is a common species along the southern Great Barrier Reef, Queensland, Australia, reaching southwards to 24°S and northwards to 14°S, where it is sympatric with *D. alleni*, which reaches southwards to about 15°S. *Diancistrus longifilis* is the only species of the genus *Diancistrus* along the isolated Lord Howe Ridge – Lord Howe Island, Middleton and Elizabeth Reefs – which is also the southern-most occurrence of the genus (31°S). To the east, *D. longifilis* is known from New Caledonia and the Loyalty Islands; further to the east, at the Tonga Islands, it is replaced by *D. manciporus* n. sp.

*Diancistrus mcgrouther*i n. sp.

(Figs 17, 45, 46; Table 21)

Material examined. (17 specimens, 30–60 mm SL). Holotype – WAM P. 29627-047, male, 36 mm SL, 16°31'S, 147°50'E, Holmes Reef, Coral Sea, 30–60 m, G.R. Allen and M. Allen, 4 Nov. 1987. Paratypes – AMS I. 18739-121, 3 females, 32–45 mm SL, 14°42'S, 145°27'E, Lizard Island, Great Barrier Reef, J.R. Paxton and party, 21 Nov. 1975; AMS I. 33752-023, 1 male, 45 mm SL, 09°34'S, 144°46'E, Portlock Reef, Coral Sea, 29 Jan. 1993; USNM 366525, 1 male, 47 mm SL, 05°S, 145°°E, Madang Harbour, Papua New Guinea, B. Collette, 1 June 1970; USNM 374182, 1 female, 43 mm SL, Lemus Island, New Ireland, Papua New Guinea, T. Roberts, 20–25 Jan. 1976; WAM P. 27469-010, 1 male, 43 mm SL, 15°50'S, 145°50'E, Escape Reef, Queensland, Great Barrier Reef, G.R. Allen *et al.*, 31 Oct. 19081.

Additional specimens. AMS I. 19483-083, 1 male, 30 mm SL, 14°S, 145°E, Lizard Island, Great Barrier Reef, Queensland, Australia; AMS I. 20757-112, 1 female, 60 mm SL, Raine Island, Great Barrier Reef, Queensland, Australia; AMS I. 20774-016, 1 female, 38 mm SL, 14°S, 144°E, Cape Melville, Great Barrier Reef, Queensland, Australia; AMS I. 20775-092, 1 male, 40 mm SL, Raine Island, Great Barrier Reef, Queensland, Australia; AMS I. 22573-014, 1 male, 39 mm SL and 1 female, 45 mm SL, 15°S, 145°E, Escape Reef, Great Barrier Reef, Queensland, Australia; AMS I. 23848-004, 1 female, 40 mm SL, 14°S, 145°E, Lizard Island, Great Barrier Reef, Queensland, Australia; AMS I. 25109-062, 1 male, 42 mm SL, 13°S, 146°E, Osprey Reef, Coral Sea; USNM 366503, 1 female, 55 mm SL, 05°S, 145°°E, Madang, Papua New Guinea.

Diagnosis. Vertebrae 11+30=41, dorsal fin rays 73–76, anal fin rays 56–61; eyes small (1.5–2.1% SL); outer pseudoclasper with small ear-lobe extension opening inwards; inner pseudoclasper free from outer pseudoclasper, with supporter, forming a sharp, forward-inclined thorn; narrow scale patch on cheek, no scales on operculum; head profile slender; otolith length to height ratio 2.0–2.2.

Description. The principal meristic and morphometric characters are shown in Table 21. Body slender, with slender snout; fishes small, mature at about 30 to 35 mm SL. Head with narrow scale patch on cheek with 4–5 scale rows on upper cheek, no scales on operculum. Horizontal diameter of body scales 1.3% SL. Maxillaries expanded posteriorly with angle at rear ventral corner. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril about twice the size of anterior nostril, surrounded by funnel-shaped circular flap, about 1/4 the size of eye.

Head sensory pores (Fig. Fig. 46 A-B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior).

Table 21. Meristic and morphometric characters of *Diancistrus mcgroutheri* n. sp.

	Holotype WAM P. 29627-047	Holotype + 7 paratypes Mean (range)	N
Standard length in mm	35	40.3 (31-48)	8
Meristic characters			
Dorsal fin rays	75	73.9 (73-76)	8
Anal fin rays	61	58.8 (56-61)	8
Pectoral fin rays	22	20.8 (20-22)	6
Precaudal vertebrae	11	11	8
Caudal vertebrae	30	30	8
Total vertebrae	41	41	8
Rakers on anterior gill arch	16	16.1 (14-18)	8
Pseudobranchial filaments	-	2	6
D/V	6	6	8
D/A	20	20.1 (19-22)	8
V/A	13	13	8
Morphometric characters in % of SL			
Head length	28.1	27.3 (26.0-29.9)	8
Head width	12.5	12.9 (11.7-14.5)	8
Head height	16.5	16.8 (15.8-18.5)	8
Upper jaw length	13.8	13.6 (12.8-14.1)	8
Maxillary height	4.2	4.0 (3.5-4.4)	8
Diameter of pigmented eye	1.6	1.7 (1.5-2.1)	8
Interorbital width	7.0	7.2 (6.4-8.0)	8
Postorbital length	20.2	20.5 (19.6-21.4)	8
Preanal length	49.1	46.7 (44.8-49.1)	8
Predorsal length	33.3	32.4 (31.4-33.5)	8
Body depth at origin of anal fin	18.7	18.0 (17.3-18.7)	8
Pectoral fin length	-	15.7 (15.1-16.4)	7
Pelvic fin length	25.1	26.0 (21.5-29.4)	7
Base pelvic fin - anal fin origin	30.7	28.5 (25.3-33.3)	8

Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 4 rows of granular teeth and 1 tooth row anteriorly, including a few fang-like teeth closest to symphysis, up to ½ pupil diameter. Six rows of granular teeth posteriorly. Vomer with 1 row of granular teeth. Palatine with 2 irregular rows of equally sized teeth. Dentary with 5 rows of granular teeth and 1 tooth row anteriorly, blending into one row of about 8 large, curved, fang-like teeth posteriorly, about the size of pupil diameter.

Otolith (Fig. 46 G-H). Elongate, with much expanded slender posterior tip resulting in length to height relation of 2.0–2.2 (36–45 mm SL); otolith length to sulcus length 2.2; sulcus not inclined. Anterior and posterior tips of otolith moderately pointed.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–8 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, but not reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 46 C-F). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper ear-lobe shaped, the small ear-lobe extension confined to rear half and opening inwards; inner pseudoclasper free from outer pseudoclasper, with supporter, forming sharp, forward-inclined thorn, anteriorly connected to isthmus by ligament, posteriorly with small fleshy flap. Isthmus between pseudoclaspers moderately wide. Penis short, curved, slender.

Coloration. Live colour not known. Uniformly light brown when preserved.

Comparison. *Diancistrus mcgrontheri* belongs to the group of species with ear-lobe shaped outer pseudoclaspers and small eyes (*Diancistrus erythraeus* subgroup) also containing *D. atollorum, D. erythraeus, D. robustus* n. sp. and *D. tongaensis* n. sp. Except for *D. robustus* n. sp., the species of this subgroup are further characterized by the low number of vertebrae (39–41, rarely 42 versus 43 in *D. robustus* n. sp.) and the slender head (head width ≤16% SL versus >16% SL in *D. robustus* n. sp.). The remaining four species are best distinguished by means of pseudoclaspers. In *D. mcgrontheri* and *D. tongaensis* n. sp. the inner pseudoclasper is free from the outer pseudoclasper, whereas in *D. atollorum* and *D. erythraeus* (and *D. robustus* n. sp.) it is firmly joined to the outer pseudoclasper. Apparently, *D. mcgrontheri* is closest to *D. tongaensis* n. sp., differing in the small, inwardly directed ear-lobe extension of the outer pseudoclasper (versus large and ventrally opened) and the thorn-like anteriorly inclined inner pseudoclasper (versus broad, distally expanded flap).

Within its area of distribution *D. mcgrontheri* could potentially be confused with *D. leisi* in the absence of males, being the only other small-eyed *Diancistrus* species, and also in lacking scales on the operculum. However, *D.*

Fig. 45. *Diancistrus mcgroutheri* n. sp. Holotype. WAM P. 29627-047, male, 36 mm SL.

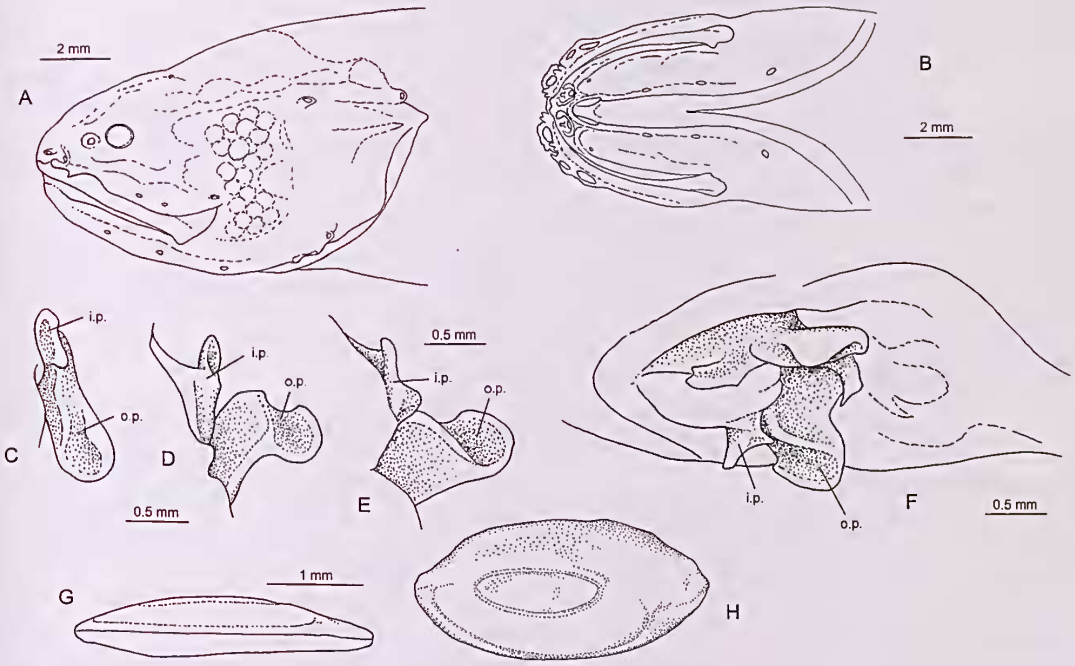

Fig. 46. *Diancistrus mcgroutheri* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, view of left pseudoclasper from ventral, holotype; **D**, view of left pseudoclasper from inside, holotype; **E**, view of left pseudoclasper from inside, WAM P. 27469-010, 43 mm SL; **F**, inclined lateral view of male copulatory organ, WAM P. 27469-010, 43 mm SL; **G**, ventral view of right otolith, AMS I. 33752-023, male 45 mm SL; **H**, median view of right otolith, AMS I. 33752-023, male 45 mm SL.

leisi is also distinguished by the narrow scale patch on the lower cheek and the laterally very compressed head with the dorsally positioned eyes.

Distribution (Fig. 17). *Diancistrus mcgroutheri* is mainly known from the Coral Sea, i.e., the northern Great Barrier Reef and along the southern part of New Guinea (Papua New Guinea) including Madang and the Trobriand Islands. Much further to the west, south of Sumatra, possibly related small-eyed female specimens are mentioned as *Diancistrus* sp. 3.

Etymology. Named in honour of Mark McGrouther, Sydney, Australia, in recognition of his great help with our revision of the Dinematichthyini.

Diancistrus machidai n. sp.

(Figs 20, 47, 48; Table 22)

Material examined. (10 specimens, 31–60 mm SL). HOLOTYPE – USNM 372962, male, 42 mm SL, 05°17'20"S, 122°04'00"E, Tallabassi Bay, just off NE tip of Big Damalawa Islet, Kabaena Island, Sulawesi, Sulawesi Tenggara Province, Indonesia, 2–15 m, V.G. Springer and M.F. Gomon, 25 Feb. 1974. PARATYPES – AMS I. 18469-183, 1 male, 45 mm SL, 03°01'S, 128°03'E, Ceram, Moluccas, Indonesia, J.R. Paxton, 1 April 1975; BPBM 26739, 1 male, 31 mm SL, 05°S, 119°E, Ujung Padang, Sulawesi, Indonesia, J.E. Randall, G.W. Tribble and R.P.H. Rutherford, 8 Sept. 1978; USNM 99224, 1 male, 41 mm SL, 09°N, 125°E, Surigao, Mindanao, Philippines, RV Albatross, 8 May 1908; USNM 263686, 1 male, 42 mm SL, 10°52'N, 120°56'E, Cuyo Islands, Palawan, Philippines, 23 May 1978; USNM 300088, 1 male, 60 mm SL, 20°24'N, 121°55'E, Batanes Islands, Philippines, G.D. Johnson *et al.*, 1 May 1987; USNM 366498, 1 male, 35 mm SL, 05°52'S, 110°25'E, Karimundjawa Archipelago, Java Sea, Indonesia, V.G. Springer *et al.*, 29 March 1974; USNM 374159, 1 male, 43 mm, 05°51'S, 106°34'E, Seribu Islands, Java Sea, Indonesia, V.G. Springer *et al.*, 5 April 1974; USNM 374181, 1 male, 34 mm SL, 20°24'N, 121°55'E, Batanes Province, Philippines, G.D. Johnson *et al.*, 2 May 1987; USNM 374193, 1 female, 47 mm SL, 09°10'N, 123°26'E, Siquijor Island, Visayan Islands, Philippines, V.G. Springer *et al.*, 10 May 1978.

Diagnosis. Vertebrae 11+29–31 (32)=40–42 (43), dorsal fin rays 66–77, anal fin rays 50–64; eyes large (2.4–3.3% SL), D/V 6–7; outer pseudoclasper long, thick, with almost straight hook-like extension in ventral view; inner pseudoclasper anteriorly joined to outer pseudoclasper, broad, its supporter extended as distinct thorn to nearly length of extension of outer pseudoclasper; moderately wide scale patch on cheek with 5–6 scale rows on upper cheek, 0–2 scales on operculum above opercular spine; head slender, broad; otolith length to height ratio 2.0–2.1; sulcus short, ratio otolith length to sulcus length 2.3–2.5.

Table 22. Meristic and morphometric characters of *Diancistrus machidai* n. sp.

	Holotype USNM 372962	Holotype + 9 paratypes	N
		Mean (range)	
Standard length in mm	42	42.1 (31-60)	10
Meristic characters			
Dorsal fin rays	75	72.5 (66-77)	10
Anal fin rays	59	57.7 (50-64)	10
Pectoral fin rays	-	18.3 (17-19)	8
Precaudal vertebrae	11	11	10
Caudal vertebrae	31	30.7 (29-32)	10
Total vertebrae	42	41.7 (40-43)	10
Rakers on anterior gill arch	17	16.8 (14-21)	10
Pseudobranchial filaments	2	2	8
D/V	6	6.5 (6-7)	10
D/A	19	19.0 (17-21)	10
V/A	13	13.2 (13-14)	10
Morphometric characters in % of SL			
Head length	26.2	27.0 (25.6-29.8)	9
Head width	12.1	11.6 (10.3-13.3)	8
Head height	20.7	17.6 (14.3-20.7)	9
Upper jaw length	13.1	13.3 (12.3-14.9)	9
Maxillary height	-	4.3 (3.8-4.9)	7
Diameter of pigmented eye	3.1	2.8 (2.4-3.3)	9
Interorbital width	6.2	5.7 (3.9-7.6)	9
Postorbital length	18.3	19.3 (17.7-22.5)	9
Preanal length	50.0	49.2 (47.5-52.2)	9
Predorsal length	36.4	35.1 (32.1-38.6)	9
Body depth at origin of anal fin	20.5	17.6 (14.4-20.5)	9
Pectoral fin length	-	15.7 (12.9-17.8)	8
Pelvic fin length	24.3	24.9 (22.7-28.1)	4
Base pelvic fin - anal fin origin	29.0	28.8 (25.8-31.7)	9

Description. The principal meristic and morphometric characters are shown in Table 22. Body and head slender; fishes mature at about 35 to 40 mm SL. Head with scale patch on cheek with 5–6 scale rows on upper cheek, 0–1, rarely 2 scales above the opercular spine. Horizontal diameter of body scales 1.3% SL. Maxillaries expanded posteriorly with angle at rear ventral corner and indistinct knob in front of rear angle. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril located very close to eye, usually opening towards the eye, slightly larger than anterior nostril, about 1/5 the size of eye.

Head sensory pores (Fig. 48 A-C). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior), the 3rd posterior mandibular pore twice the size of the two other posterior mandibular pores. Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 6 rows of granular teeth and 1 tooth row anteriorly, including a few fang-like teeth closest to symphysis, up to 1/3 pupil diameter. Six granular rows posteriorly. Vomer with 2 tooth rows, with teeth on posterior inner row the largest. Palatine with 2 rows of equally sized teeth. Dentary with 5 rows of granular teeth and 1 tooth rows anteriorly, blending into one row of about 7 large, curved, fang-like teeth posteriorly, fang size about 1/2 the size of pupil diameter.

Otolith (Fig. 48 M). Moderately elongate with pointed anterior and more rounded posterior tips, length to height 2.0–2.1 (34–62 mm SL); otolith length to sulcus length 2.3–2.5; sulcus slightly inclined at 5°. Otoliths from males with gently curved dorsal rim and shallow or absent postdorsal angle, otoliths from females with marked postdorsal angle and flat middle part of dorsal rim. As in *D. fuscus,* this subtle sexual dimorphism is opposite to the trend observed in most other species of the genus.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–8 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, reaching tip of last precaudal parapophysis in males, slightly shorter in females.

Male copulatory organ (Fig. 48 D-L). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper long, thick, with almost straight hook-like extension in ventral view, but bent at a 90° angle in lateral view, with massive supporter; inner pseudoclasper anteriorly joined to outer pseudoclasper, broad, its strong supporter extended as a distinct thorn to nearly the length of the extension of the outer pseudoclasper, with fleshy flap along posterior margin. Isthmus between pseudoclaspers moderately wide. Penis moderately long, curved, tapering with thin tip.

Fig. 47. *Diancistrus machidai* n. sp. Holotype. USNM 372962, male, 42 mm SL.

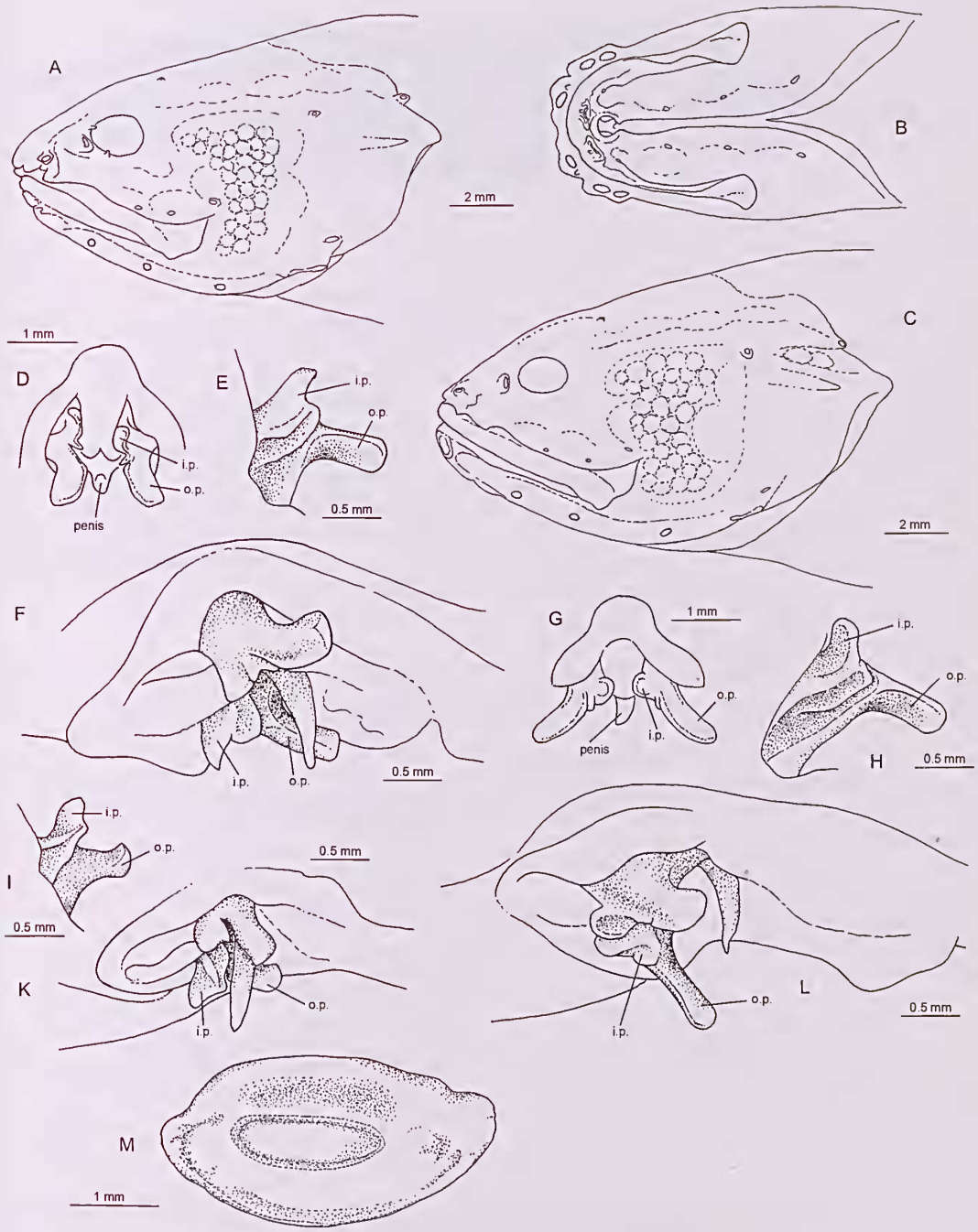

Fig. 48. *Diancistrus machidai* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, lateral view of head, USNM 374159, male, 43 mm SL; **D**, ventral view of male copulatory organ, holotype; **E**, view of left pseudoelasper from inside, holotype; **F**, inclined lateral view of male copulatory organ, holotype; **G**, ventral view of male copulatory organ, USNM 374159, 43 mm SL; **H**, view of left pseudoelasper from inside, USNM 374159, 43 mm SL; **I**, view of left pseudoelasper from inside, USNM 374181, 34 mm SL; **K**, inclined lateral view of male copulatory organ, USNM 374181, 34 mm SL; **L**, inclined lateral view of male copulatory organ, USNM 374159, 43 mm SL; **M**, median view of right otolith, USNM 300088, male, 60 mm SL.

Coloration. Live colour not known. Uniformly light brown when preserved.

Comparison. *Diancistrus machidai* belongs to the group of species with hook- or stick-shaped outer pseudoclaspers, which includes *D. alleni, D. beateae, D. fuscus, D. leisi, D. longifilis, D. manciporus* n. sp., *D. novaeguineae, D. springeri* n. sp. and *D. vietnamensis* n. sp. *Diancistrus machidai* has either no scales on the operculum like *D. leisi* (which, however, has stick-like outer pseudoclaspers), *D. longifilis* and *D. manciporus* n. sp., or 1 or 2 scales above the opercular spine similar to *D. alleni*. *Diancistrus machidai* is easily recognized by the long spiny inner pseudoclasper, whereas *D. leisi* differs in the stick-like outer pseudoclasper. *Diancistrus machidai* is further distinguished from *D. alleni, D. longifilis* and *D. manciporus* n. sp., by its low number of vertebrae (40–43 versus 43–45) and the low number of dorsal fin rays (66–77 versus 75–85).

Remarks. *Diancistrus machidai* shows an unusual large degree of variability, e.g., in the presence or absence of scales above the opercular spine and the wide range in dorsal fin ray counts. At the southern limit of its distribution, off Java, a specimen is recorded with 2 scales above the opercular spine and a more straight and long outer pseudoclasper (Fig. 46 C, G, H, L). At the northern limit, Batanes Islands of the Philippines, a specimen was found to have a shorter outer pseudoclasper, which is also more flat and less bent than the typical hook-shape (Fig. 46 I, K). It is possible that with more material available, a separation into two species may become advisable.

Distribution (Fig. 20). *Diancistrus machidai* is widely distributed in the West Pacific but not common. It ranges from Java and Sulawesi in the south-west to the Batanes Islands of the Philippines in the north-east.

Etymology. Named in honour of Yoshihiko Machida of Japan for his many contributions to the knowledge of ophidiiform fishes.

Diancistrus manciporus n. sp.

(Figs 12, 49, 50; Table 23)

Material examined. (5 specimens, 23–67 mm SL). Holotype – USNM 374179, male, 53 mm SL, 21°02°S, 175°12'W, Atata Island, reef near ship channel, Tongatapu, Tonga, vertical wall to about 20 m with sand and rubble at base, 15–20 m, J. T. Williams *et al.*, 22 Oct. 1993. Paratypes – USNM 384599, 1 female, 67 mm SL, 1 sub-adult male, 38 mm SL and 2 juveniles, 23–27 mm SL, same data as holotype.

Diagnosis. Vertebrae 11+32–34=43–45, dorsal fin rays 79–84, anal fin rays 64–67; outer pseudoclasper with hook-like short and pointed extension and slightly bent distally and with thin supporter; inner pseudoclasper anteriorly connected to outer pseudoclasper, wide and concave due to broad thin flap, strongly anteriorly inclined; no scales on operculum; upper preopercular pore absent.

Description. The principal meristic and morphometric characters are shown in Table 23. Body slender with pointed snout; fishes mature at more than 50 mm SL. Head with moderately wide scale patch on cheek containing 5–6 scale rows on the upper cheek; no scales on operculum. Horizontal diameter of body scales 1.6% SL. Maxillaries expanded posteriorly with angle at rear ventral corner. Anterior nostril low on snout, 1/3 distance from tip of snout to anterior margin of eye. Posterior nostril about the size of anterior nostril and about 1/6 the size of eye.

Head sensory pores (Fig. 50 A-B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 5 rows of granular teeth and 1 tooth row anteriorly, including a few fang-like teeth closest to symphysis, up to 1/3 pupil diameter. Eight rows of granular teeth posteriorly. Vomer with 3 rows of teeth, largest posteriorly on the inner row. Palatine teeth in 3 irregular rows, teeth on inner row slightly larger than on outer rows. Dentary with 5 rows of granular teeth and 1 tooth row anteriorly, blending into one row of about 10 large, curved, fang-like teeth posteriorly, fang size up to 1/2 pupil diameter.

Table 23. Meristic and morphometric characters of *Diancistrus manciporus* n. sp.

	Holotype USNM 374179	Holotype + 4 paratypes	N
		Mean (range)	
Standard length in mm	53	41.0 (22-65)	5
Meristic characters			
Dorsal fin rays	79	81.4 (79-84)	5
Anal fin rays	64	65.8 (64-67)	5
Pectoral fin rays	20	20	4
Precaudal vertebrae	11	11	5
Caudal vertebrae	33	32.8 (32-34)	5
Total vertebrae	44	43.8 (43-45)	5
Rakers on anterior gill arch	16	16.0 (15-17)	4
Pseudobranchial filaments	2	2	4
D/V	6	6	5
D/A	19	20.6 (19-22)	5
V/A	13	13	5
Morphometric characters in % of SL			
Head length	26.6	27.6 (26.6-29.0)	5
Head width	12.6	12.9 (12.0-13.6)	4
Head height	16.5	16.9 (16.5-17.7)	4
Upper jaw length	12.5	12.8 (12.4-13.5)	3
Maxillary height	4.2	4.1 (3.6-4.6)	4
Diameter of pigmented eye	2.8	3.1 (2.8-3.5)	5
Interorbital width	5.8	6.6 (5.8-7.9)	4
Postorbital length	18.6	19.4 (18.6-20.6)	3
Preanal length	49.0	47.6 (46.7-49.0)	3
Predorsal length	32.1	33.3 (32.1-34.0)	4
Body depth at origin of anal fin	16.3	17.2 (16.3-18.4)	4
Pectoral fin length	15.5	15.7 (14.4-16.6)	4
Pelvic fin length	24.8	24.1 (21.8-25.7)	3
Base pelvic fin - anal fin origin	28.0	26.3 (24.7-28.0)	4

Fig. 49. *Diancistrus manciporus* n. sp. Holotype. USNM 374179, male, 53 mm SL.

Otolith (Fig. 50 F–G). Moderately elongate, length to height 1.9–2.0 (55–67 mm SL); otolith length to sulcus length 2.1–2.2; sulcus inclined at an angle of 5°. Anterior tip of otolith pointed; posterior tip less pointed. Strong postdorsal angle in males, more rounded in females.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–9 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2- (10) 11. First anal fin pterygiophore elongated, but not reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 50 C–E). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper hook-shaped, hook-like extension short, pointed and slightly bent at its termination, with thin supporter; inner pseudoclasper anteriorly connected to outer pseudoclasper, wide and concave due to broad thin flap, strongly anteriorly inclined. Isthmus between pseudoclaspers narrow. Penis long, curved, moderately thin.

Coloration. Live colour not known. Uniformly light brown when preserved.

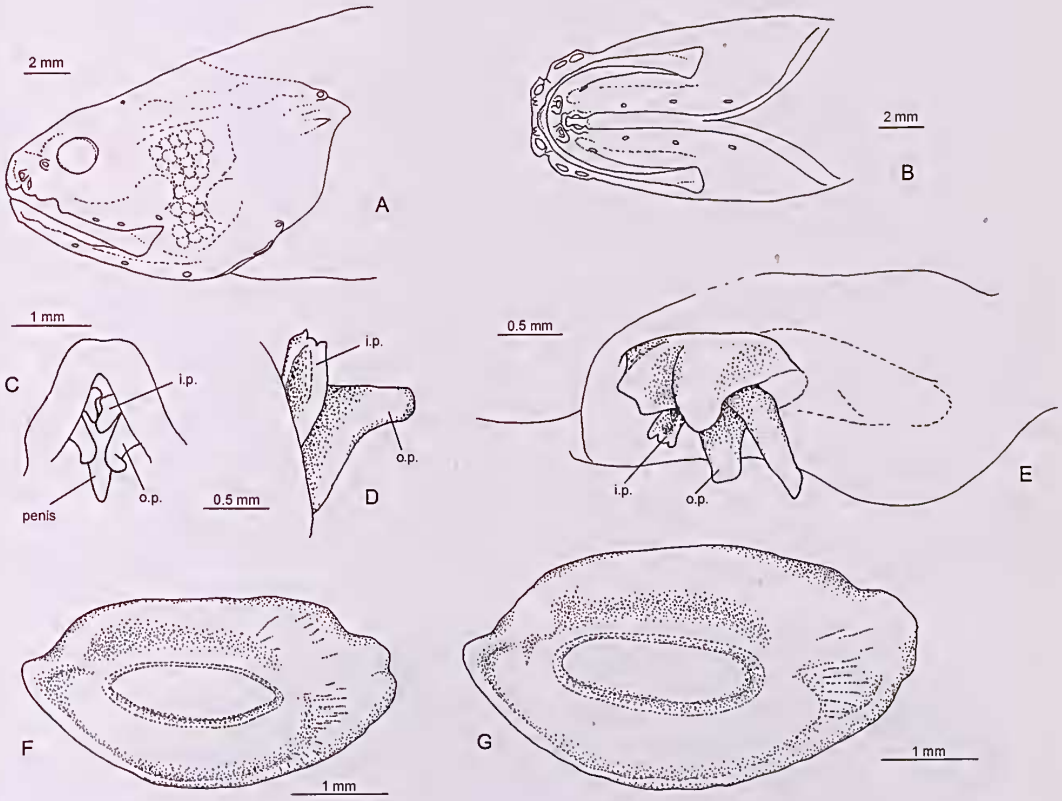

Fig. 50. *Diancistrus manciporus* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, ventral view of male copulatory organ, holotype; **D**, view of left pseudoclasper from inside, holotype; **E**, inclined lateral view of male copulatory organ, holotype; **F**, median view of right otolith, holotype; **G**, median view of right otolith, USNM 384599, female, 67 mm SL.

Comparison. *Diancistrus manciporus* belongs to the group of species with hook- or stick-shaped outer pseudoclaspers like *D. alleni, D. beateae, D. fuscus, D. leisi, D. longifilis, D. machidai, D. novaegnineae, D. springeri* n. sp. and *D. vietnamensis* n. sp. It is most similar to *D. longifilis*, from which it is probably derived. The main differences to *D. longifilis* are the lack of an upper preopercular pore (versus present) and the strongly forward inclined inner pseudoclasper (versus not forward inclined).

Distribution (Fig. 12). *Diancistrus manciporus* has so far only been found at the southern part of Tongatapu.

Etymology. The name refers to the lack of an upper preopercular pore – *mancus* (Latin) = missing and *porus* (Latin) = pore.

Diancistrus mennei n. sp.

(Figs 40, 51, 52; Table 24)

Material examined. (10 specimens, 25–76 mm SL). Holotype – BPBM 22384, male, 48 mm SL, Eniwetok Atoll, Marshall Islands, J.E. Randall *et al.*, April-May 1978.

Tentatively assigned specimens: AMS I. 18051-048, 1 female, 65 mm SL, 01°44'N, 172°59'E, Abaiang Atoll, Gilbert Islands, Kiribati, D.F. Hoese and B. Goldman, 10 Nov. 1973; MCZ 158555, 1 female, 31 mm SL, 02°50'S, 171°42'W, Canton Island, Kiribati, S. Bailey *et al.*, 4 July 2000; MCZ 158556, 1 juvenile, 25 mm SL, 03°43'S, 170°42'W, Phoenix Island, Kiribati, S. Bailey *et al.*, 6 July 2000; MCZ 162574, 4 females, 42–76 mm SL, 02°46'S, 171°43'W, Canton Island, Kiribati, G.R. Allen *et al.*, 24 June 2002; MCZ 162575, 2 females, 39–45 mm SL, 04°31'S, 172°13'W, Orona Atoll, Gilbert Islands, Kiribati, G.R. Allen, 2 July 2002.

Diagnosis. Vertebrae 11+34=45, dorsal fin rays 88, anal fin rays 69; eye large (3.4% SL), D/V 6; outer pseudoclasper moderately large, short (about 1 ½ length of inner pseudoclasper), wing-shaped, flat with broad base; inner pseudoclasper joined to outer pseudoclasper anteriorly, with thin, sharp, slightly anteriorly directed single-pointed tip extending over anterior part of outer pseudoclasper; moderately broad scale patch on cheek with 5 scale rows on upper cheek, large scale patch on operculum above opercular spine (8 scales); head broad, rather flat dorsally; otolith slender, length to height ratio 2.2.

Table 24. Meristic and morphometric characters of *Diancistrus mennei* n. sp.

	Holotype BPBM 22384	9 tentatively assigned spec. Mean (range)	N
Standard length in mm	47	46.4 (24-76)	10
Meristic characters			
Dorsal fin rays	88	83.3 (80-86)	10
Anal fin rays	69	65.3 (62-68)	10
Pectoral fin rays	21	18	3
Preeaudal vertebrae	11	11	10
Caudal vertebrae	34	34.0 (33-35)	10
Total vertebrae	45	45.0 (44-46)	10
Rakers on anterior gill arch	21	16.0 (15-18)	4
Pseudobranchial filaments	2	2	4
D/V	6	6	10
D/A	23	20.7 (19-22)	10
V/A	13	12.9 (12-14)	10
Morphometric characters in % of SL			
Head length	28.1	27.1 (26.2-27.8)	4
Head width	13.0	13.3 (13.1-13.7)	4
Head height	20.0	18.1 (15.6-23.0)	4
Upper jaw length	15.1	13.5 (12.9-14.2)	4
Maxillary height	4.7	4.4 (3.9-5.2)	4
Diameter of pigmented eye	3.4	3.2 (3.2-3.3)	4
Interorbital width	6.4	6.5 (6.3-6.8)	4
Postorbital length	19.8	19.6 (18.8-20.3)	4
Preanal length	49.1	46.2 (44.4-48.8)	4
Predorsal length	35.1	32.0 (30.3-34.5)	4
Body depth at origin of anal fin	18.9	17.8 (16.1-19.2)	4
Pectoral fin length	19.1	17.9 (17.5-18.3)	3
Pelvic fin length	22.6	24.0 (23.6-24.6)	4
Base pelvic fin - anal fin origin	28.1	26.3 (25.2-26.9)	4

Description. The principal meristic and morphometric characters are shown in Table 24. Body moderately compact, with broad, dorsally compressed head and pointed snout, mature at about more than 45 mm SL. Head with moderately broad scale patch (5 scale rows) on upper cheek, large scale patch on operculum above opercular spine (8 scales) in 3 rows and no scales below opercular spine. Horizontal diameter of body scales 1.6% SL. Maxillaries expanded posteriorly with prominent angle at rear ventral corner. Anterior nostril low on snout, 1/3 distance from tip of snout to anterior margin of eye. Posterior nostril about twice the size of anterior nostril and about 1/5 the size of eye.

Fig. 51. *Diancistrus mennei* n. sp. Holotype. BPBM 22384, male, 48 mm SL.

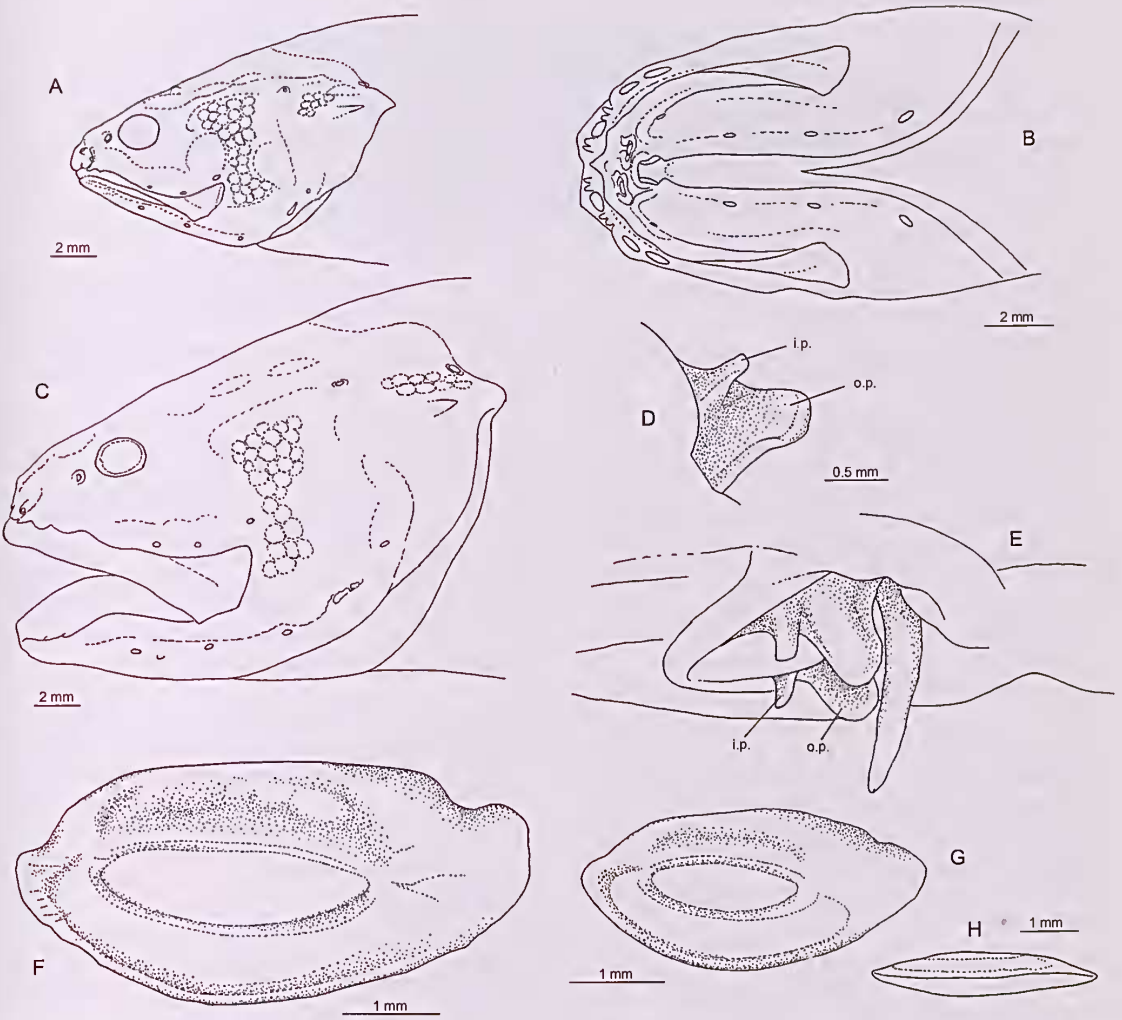

Fig. 52. *Diancistrus mennei* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, lateral view of head, MCZ 162574, tentatively assigned female, 76 mm SL; **D**, view of left pseudoclasper from inside, holotype; **E**, inclined lateral view of male copulatory organ, holotype; **F**, median view of right otolith, MCZ 162574, tentatively assigned female, 76 mm SL; **G**, median view of right otolith, holotype; **H**, ventral view of right otolith, holotype.

Head sensory pores (Fig. 52 A–C). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 4 rows of granular teeth and 1 tooth row anteriorly, with teeth up to 1/4 of pupil diameter. Seven granular rows posteriorly. Vomer teeth in 2 rows, teeth on inner row slightly larger than on outer row. Palatine teeth in 2 rows of similar sized teeth. Dentary with 3 granular rows and 1 tooth row anterior, blending into one row of about 5 large fang-like teeth posteriorly.

Otolith (Fig. 52 F-H). Elongate with pointed anterior and posterior tips, length to height 2.2 (48 mm SL); otolith length to sulcus length 1.9; sulcus slightly inclined at 5°.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–8 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 52 D-E). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper short (about 1 1/2 length of inner pseudoclasper), wing-shaped, with broad base, broad supporter and flat inner face, not expanded distally; inner pseudoclasper joined to outer pseudoclasper anteriorly, thin, sharp, slightly anteriorly directed, with single-pointed tip extending over anterior part of outer pseudoclasper. Isthmus between pseudoclaspers moderately wide. Penis long, curved, thin.

Coloration. Live colour not known. Uniformly light brown when preserved.

Comparison. *Diancistrus mennei* belongs to the group with wing-shaped outer pseudoclasper and a single-tipped inner pseudoclasper, which includes *D. katrineae, D. eremitus, D. karinae, D. jeffjohnsoni* and *D. polmpeiensis* n. sp. It differs from all these species in the relatively short outer pseudoclasper and the anteriorly directed inner pseudoclasper. *Diancistrus katrineae* and *D. karinae* both have scales on the operculum above and below the opercular spine (versus above opercular spine only). From the remainder of species *D. mennei* differs in the higher number of scales above the opercular spine (8 versus 1–4) and the more slender otoliths (length to height ratio 2.2 versus ≤2.1).

Diancistrus mennei occurs associated with *D. beateae*, from which it is easily distinguished by the lack of a continuous scale patch on the operculum with scales below the opercular spine (versus present), and *D. atollorum*, which belongs to the group with ear-lobe shaped outer pseudoclaspers, small eyes and no scales on the opereulum.

Remarks. The holotype from the Eniwetok Atoll, Marshall Islands, represents the only male known. The 9 females from Kiribati closely resemble the holotype in all characters. Due to the geographic distance between the two localities and the lack of a male these specimens are tentatively assigned and not designated as paratypes.

Distribution (Fig. 40). *Diancistrus mennei* is known from the Marshall Islands and probably from Kiribati.

Etymology. Named after Tammes Menne, Copenhagen, Denmark, for his great help during this revisionary work.

Diancistrus niger n. sp.

(Figs 20, 53, 54; Table 25)

Material examined. (8 specimens, 30–45 mm SL). Holotype – WAM P. 31543-005, male, 40 mm SL, 00°37S, 130°33E, Raja Ampat Islands, Mansuar Island, Waigeo, Papua, Indonesia, 0–4 m, G.R. Allen and S. Morrison, April 1999. Paratypes – WAM P. 31543-004, 2 males, 30–42 mm SL and 2 females, 38–44 mm SL, same data as holotype; WAM P. 31541-011, 1 male, 45 mm SL, 00°48'S, 130°30'E, Raja Ampat Islands, Batanta Island, Waigeo, Papua, Indonesia, G.R. Allen, 14 April 1999; ZMUC P 771470, 1 male, 32 mm SL and ZMUC P 771471, 1 female, 43 mm SL, same data as WAM P. 31543-004.

Diagnosis. Vertebrae 11+30–32=41–43, dorsal fin rays 69–76, anal fin rays 52–59; eyes large (3.0–3.6% SL); outer pseudoclasper large, broad, ear-lobe shaped, opening ventrally; inner pseudoclasper a fleshy appendix at anterior-inner rim of outer pseudoclasper, without supporter; no scales on operculum; head compressed, blunt; otoliths elongate, ratio otolith length: height 2.3, anterior and posterior tips of otolith almost equally pointed; colour dark grey to black in preservation.

Description. The principal meristic and morphometric characters are shown in Table 25. Body moderately compact, but not high-necked, snout pointed; fishes small, mature at about 30 mm SL. Head with narrow scale patch on cheek with 5 scale rows on upper cheek, no scales on operculum. Horizontal diameter of body scales 1.4% SL. Maxillaries slightly expanded posteriorly, broadly rounded. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril large, slightly larger than anterior nostril and about 1/5 the size of eye.

Head sensory pores (Fig. 54 A-B). Supraorbital pores 3. Additional small pore often visible below eye. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 3 rows of granular teeth and 2 tooth rows anteriorly, including one fang-like tooth closest to symphysis, about ½ pupil diameter. Six rows of granular teeth posteriorly. Vomer teeth in 3 rows, teeth on inner row slightly larger than on outer rows. Palatine teeth in 3 rows of similar sized teeth. Dentary with 2 rows of granular teeth and 2 tooth rows anteriorly, blending into one row of about 10 large fang-like teeth posteriorly, fang size about 1/2 pupil diameter.

Table 25. Meristic and morphometric characters of *Diancistrus niger* n. sp.

	Holotype WAM P. 31543-005	Holotype + 7 paratypes	N
		Mean (range)	
Standard length in mm	40	39.0 (30-45)	8
Meristic characters			
Dorsal fin rays	75	73.4 (69-76)	7
Anal fin rays	59	56.6 (52-59)	7
Pectoral fin rays	17	17.2 (17-18)	6
Precaudal vertebrae	11	11	7
Caudal vertebrae	31	30.9 (30-32)	7
Total vertebrae	42	41.9 (41-43)	7
Rakers on anterior gill arch	15	14.6 (13-17)	8
Pseudobranchial filaments	2	2	8
D/V	7	6.9 (6-7)	7
D/A	20	19.9 (19-21)	7
V/A	14	13.6 (13-14)	7
Morphometric characters in % of SL			
Head length	30.7	29.0 (28.1-30.7)	8
Head width	15.4	15.3 (14.1-16.6)	8
Head height	18.3	18.5 (17.2-19.2)	8
Upper jaw length	14.7	14.2 (13.7-14.7)	8
Maxillary height	4.6	4.8 (4.6-5.8)	8
Diameter of pigmented eye	3.2	3.3 (3.0-3.6)	8
Interorbital width	6.8	6.8 (6.4-7.2)	8
Postorbital length	21.1	20.3 (19.4-21.1)	8
Preanal length	53.1	50.6 (46.1-53.1)	8
Predorsal length	37.2	35.7 (34.6-37.2)	8
Body depth at origin of anal fin	22.8	21.0 (20.0-22.8)	8
Pectoral fin length	20.1	17.5 (15.4-20.1)	8
Pelvic fin length	24.6	24.0 (22.3-25.4)	5
Base pelvic fin - anal fin origin	31.4	28.5 (25.5-31.5)	8

Fig. 53. *Diancistrus niger* n. sp. Holotype. WAM P. 31543-005, male, 40 mm SL.

Otolith (Fig. 54 G–H). Very slender, elongate, length to height 2.3 (32–44 mm SL); otolith length to sulcus length 2.2–2.3; sulcus not inclined. Anterior tip of otolith sharply pointed; posterior tip nearly as pointed; dorsal rim shallow, with obtuse pre- and postdorsal angles, no postdorsal concavity.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–8 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, but not reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 54 C–F). Two pairs of large pseudoclaspers. Outer pseudoclasper large, broad, ear-lobe shaped, opening ventrally and anteriorly continuously connected to inner pseudoclasper, with large but poorly defined supporter; inner pseudoclasper a fleshy appendix at anterior-inner rim of outer pseudoclasper, without supporter, forming a folded double flap. Isthmus between pseudoclaspers narrow. Penis long, curved, thin.

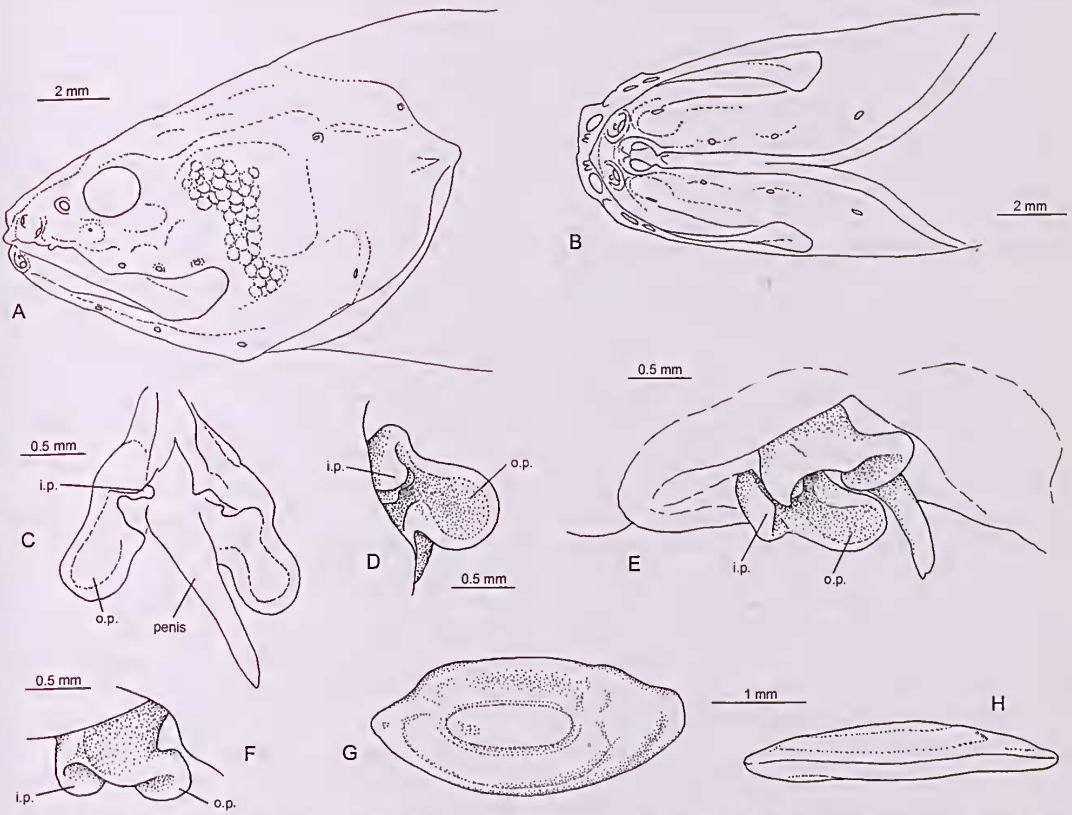

Fig. 54. *Diancistrus niger* n. sp. **A**, lateral view of head, WAM P. 31543-004, male 42 mm SL; **B**, ventral view of head, WAM P. 31543-004, male 42 mm SL; **C**, ventral view of male copulatory organ, holotype; **D**, view of left pseudoclasper from inside, WAM P. 31541-011, 45 mm SL; **E**, inclined lateral view of male copulatory organ, holotype; **F**, view of left pseudoclasper from outside, WAM P. 31541-011, 45 mm SL; **G**, median view of right otolith, WAM P. 31543-004, male 42 mm SL; **H**, ventral view of right otolith, WAM P. 31543-004, male 42 mm SL.

Coloration. Live colour not known. Uniformly dark grey to black when preserved.

Comparison. *Diancistrus niger* belongs to the group of species with ear-lobe shaped outer pseudoclaspers and to the subgroup with large eyes and atrophied inner pseudoclaspers without supporter, which contains two species, *D. altidorsalis* and *D. niger*. *Diancistrus niger* is easily distinguished from *D. altidorsalis* by the specific shape of the pseudoclaspers, the dark grey to black colour in preservation (versus light brown), the low number of vertebrae (41–32 versus 43–44), the low number of dorsal (69–76 versus 76–85) and anal fin ray (52–59 versus 61–68), the lack of scales on the operculum (versus two scale patches on the operculum, one above and one below the opercular spine) and finally the very slender otolith (otolith length to height 2.3 versus 1.9–2.0).

Remarks. Three of the 8 specimens known show deformation of the vertebral column.

Distribution (Fig. 20). *Diancistrus niger* is known only from the Raja Ampat Islands in the strait between the Waigeo Island and the Vogelkop Peninsula of northern New Guinea, Papua, Indonesia.

Etymology. The name refers to the black colour – *niger* (Latin) = black.

Diancistrus novaeguineae (Machida, 1996)

(Figs 55, 56, 57; Table 26)

Parabrosmolus novaeguineae Machida, 1996: 148, fig. 1–4 (type locality: Kranket Island, Madang Harbour, Papua New Guinea).

Parabrosmolus novaeguineae – Nielsen *et al.* 1999: 125.

Material examined. (58 specimens, 28–103 mm SL). HOLOTYPE – BMNH 1974.5.25.3586, male, 37 mm SL, Kranket Island, Madang Harbour, Papua New Guinea, 30 May 1970.

Further specimens. AMS I. 17487-018, 1 female, 59 mm SL, Doma Reef, Guadaleanal, Solomon Islands; AMS I. 18739-120, 1 male, 76 mm SL, 14°42'S, 145°27'E, Lizard Island, Great Barrier Reef, Queensland, Australia, J.R. Paxton and party, 21 Nov. 1975; AMS I. 19108-149, 1 male, 57 mm SL and 2 females, 39–48 mm SL, 14°40'S, 145°28'E, Lizard Island, Queensland, Great Barrier Reef, Queensland, Australia, D.F. Hoese and party, 17 Nov. 1975; AMS I. 20547-087, 1 male, 103 mm SL, Panasesa reef, Louisiade Archipelago, Papua New Guinea, B. Goldman, 24 March 1969; AMS I. 20937-034, 1 female, 63 mm SL, 12°02'S, 143°17'E, Haggerstone Island, Cape York, Great Barrier Reef, Queensland, Australia, 20 March 1979; AMS I. 20956-099, 2 females, 28–70 mm SL, 17°04'S, 143°57'E, Tijou reef, Cape York, Great Barrier Reef, Queensland, Australia, 23 Feb. 1979; AMS I. 21540-065, 1 male, 14°S, 145°E, Lizard Island, Great Barrier Reef, Queensland, Australia; AMS I. 22612-010, 4 males, 50–55 mm SL and 2 females, 45–50 mm SL, 15°49'S, 145°50'E, Escape Reef, Great Barrier Reef, Queensland, Australia, G.R. Allen and W.A. Starek, 1 Nov. 1981; AMS I. 37229-010, 1 male, 66 mm SL, Vanuatu; AMS I. 37920-031, 1 male, 56 mm SL, 2 females, 50–58 mm SL and 1 juvenile, 32 mm SL, 13°S, 167°E Vanua Lava, Banks Islands, Vanuatu; AMS I. 39013-013, 1 female, 67 mm SL, 10°S, 166°E Reef Islands, Santa Cruz Islands, Solomon Islands; AMS I. 39033-003, 1 male, 46 mm SL, 10°44'S, 166°49'E, Graciosa Bay, Nendo Islands, Santa Cruz Islands, Solomon Islands, 26 Sept. 1998; BPBM 32584, 1 female, 49 mm SL, 05°S, 145°E, Kranket Island, Madang, Papua New Guinea, J.E. Randall, 12 Nov. 1987; CAS 65661, 2 females, 47–54 mm SL, 05°S, 145°E, Madang, Papua New Guinea, S.G. Poss, D.G. Catania and party, 12 May 1987; ROM 78116, 1 female, 42 mm SL, 09°S, 159°E, Guadaleanal, Solomon Islands; USNM 99061, 1 female, 100 mm SL, 03°S, 126°E, Uki, Buru Island, Maluku Province, Indonesia, RV Albatross Expedition, 9 Dec. 1909; USNM 99169, 1 female, 77 mm SL, 03°S, 126°E, Tifu Bay, Buru Island, Maluku Province, Indonesia, RV Albatross Expedition, 10 Dec. 1909; USNM 210252, 1 male, 37 mm SL and 1 female, 37 mm SL, 03°S, 128°E, Ambon, Maluku Province, Indonesia; USNM 377206, 1 female, 50 mm SL, 05°S, 145°E, Madang, Papua New Guinea; USNM 361548, 1 female, 45 mm SL, 13°32'S,

Table 26. Meristic and morphometric characters of *Diancistrus novaeguineae* (Machida, 1996)

	Holotype BMNH 1974.5.25.3586	Holotype + 57 specimens Mean (range)	N
Standard length in mm	36.5	54.2 (27-103)	45
Meristic characters			
Dorsal fin rays	76	79.3 (74-85)	24
Anal fin rays	63	64.1 (60-69)	24
Pectoral fin rays	18	19.0 (17-21)	27
Precaudal vertebrae	11	11	15
Caudal vertebrae	33	32.9 (32-34)	24
Total vertebrae	44	43.9 (43-45)	24
Rakers on anterior gill arch	15	15.1 (13-17)	34
Pseudobranchial filaments	2	2.0 (2-3)	32
D/V	6	6.3 (6-7)	24
D/A	19	19.7 (18-23)	24
V/A	13	13.2 (13-14)	24
Morphometric characters in % of SL			
Head length	28.2	27.2 (25.7-29.2)	35
Head width	14.4	13.6 (10.9-17.2)	34
Head height	18.2	17.2 (14.7-20.0)	34
Upper jaw length	14.0	13.4 (11.8-14.6)	34
Maxillary height	4.4	4.3 (3.7-5.0)	35
Diameter of pigmented eye	3.4	2.8 (2.1-3.4)	36
Interorbital width	7.3	6.9 (5.7-7.8)	35
Postorbital length	20.1	19.7 (17.9-21.5)	28
Preanal length	-	46.1 (39.3-49.1)	35
Predorsal length	34.9	32.9 (29.2-35.2)	35
Body depth at origin of anal fin	19.3	18.4 (15.1-20.8)	34
Pectoral fin length	-	16.5 (11.9-18.9)	32
Pelvic fin length	-	24.3 (21.4-27.6)	19
Base pelvic fin - anal fin origin	23.7	25.8 (22.8-30.1)	34

Fig. 55. *Diancistrus novaeguineae* (Machida, 1996). Holotype. BMNH 1974.5.25.3586, male, 37 mm SL.

167°20'E, Banks Islands, Vanuatu; USNM 366473, 4 females, 36–58 mm SL, 04°20'S, 129°54'E, Banda Islands, Banda Sea, Maluku Province, Indonesia; USNM 366481, 3 females, 39–60 mm SL, 05°S, 145°E, Madang, Papua New Guinea; USNM 366497, 3 females, 30–59 mm SL, 03°47'S, 128°06'E, Ambon, Maluku Province, Indonesia; USNM 366502, 2 females, 34–62 mm SL, 05°S, 145°E, Madang, Papua New Guinea; USNM 372966, 1 male, 82 mm SL, 23°25'S, 151°55'E, Heron Island, Great Barrier Reef, Queensland, Australia, J.H. Choat, 23 Feb. 1967; USNM 384600, 1 male, 45 mm SL and 1 juvenile, 28 mm SL, 16°47'S, 168°21'E, Epi Island, Vanuatu, J. T. Williams *et al.*, 16 June 1996; USNM 384601, 1 male, 48 mm SL and 3 females, 49–65 mm SL, 19°31'S, 169°29'E, Tanna Island, Vanuatu, J. T. Williams *et al.*, 2 June 1996; ZMUC P 771490, 1 male, 61 mm SL, same data as AMS I. 18739-120; ZMUC P 771491, 1 female, 56 mm SL, same data as AMS I. 19108-149.

Tentatively assigned specimens. WAM P. 25111-045, 1 female, 61 mm SL, 20°28'S, 116°32'E, Dampier Archipelago, Western Australia, G.R. Allen, R. Steene and Ono, 3 Nov. 1974; WAM P. 30844-013, 1 female, 55 mm SL, 11°58'S, 123°21'E, Hibernia Reef, Timor Sea, G.R. Allen, 19 Sept. 1994; WAM P. 31085-038, 2 juveniles, 35 mm SL, 13°59'S, 126°20'E, Vansittart Bay, Long Island, Western Australia, J.B. Hutchins, 24 Nov. 1995.

Diagnosis. Vertebrae 11+32–34=43–45, dorsal fin rays 74–85 (mostly >77), anal fin rays 60–69, D/V 6 (rarely 7); eyes large (2.1–3.4% SL); outer pseudoclasper with broad hook-shaped extension, with rounded tip, slightly bent outwards; inner pseudoclasper short, joined to outer pseudoclasper anteriorly, supporter with anteriorly oriented small hook, and with a wide thin flap at posterior-distal margin; scale patch on cheek with 7–9 scale rows on upper cheek, many scales on operculum above opercular spin (7–16 scales in 2–4 rows), in very large specimens additional scale patch below opercular spine (4–12); head profile moderately slender; otolith length sulcus length 1.9–2.0, sulcus slightly inclined.

Description. The principal meristic and morphometric characters are shown in Table 26. Body moderately slender, fishes mature at about 35 to 40 mm SL. Head with broad scale patch on cheek containing 7–9 scale rows on upper cheek, large scale patch on operculum above opercular spine with 7–16 (mostly >10) scales in 2–4 rows, in very large specimens (>80 mm SL) a second scale patch below opercular spine with 4–12 scales. Horizontal diameter of body scales 1.2% SL. Maxillaries expanded posteriorly with angle or knob at rear ventral corner. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril small, about the size of anterior nostril and less than 1/7 the size of eye.

Head sensory pores (Fig. 56 A-C). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 3 rows of granular teeth and 1 tooth row anteriorly, including a few fang-like teeth closest to symphysis, about 1/3 pupil diameter. Seven rows of granular teeth posteriorly. Vomer teeth in 2 rows, with the larger teeth on inner row posteriorly. Palatine teeth in 2 rows, with teeth on inner row, twice as long as on outer. Dentary with 3 rows of granular teeth and 1 tooth row anteriorly, blending into one row of about 5 large fang-like teeth posteriorly, fang size about 3/4 pupil diameter.

Otolith (Fig. 56 H-I). Moderately elongate, length to height 1.9–2.0 (35–82 mm SL); otolith length to sulcus length 1.9–2.0; sulcus slightly inclined at 5°. Postdorsal angle more pronounced than predorsal angle, leading to the highest portion of the otolith shifted backward.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–8 (9) depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10 (11). First anal fin pterygiophore elongated, but not reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 56 D-G). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper with broad hook-shaped extension, with rounded tip, slightly bent outwards, with thin supporter; inner pseudoclasper short, joined to outer pseudoclasper anteriorly, supporter with anteriorly oriented small hook, and a wide thin flap at posterior-distal margin. Isthmus between pseudoclaspers moderately wide. Penis moderately long, stout, with broad base.

Coloration. Live colour not known. Uniformly medium to dark brown when preserved, holotype greenish in preservation.

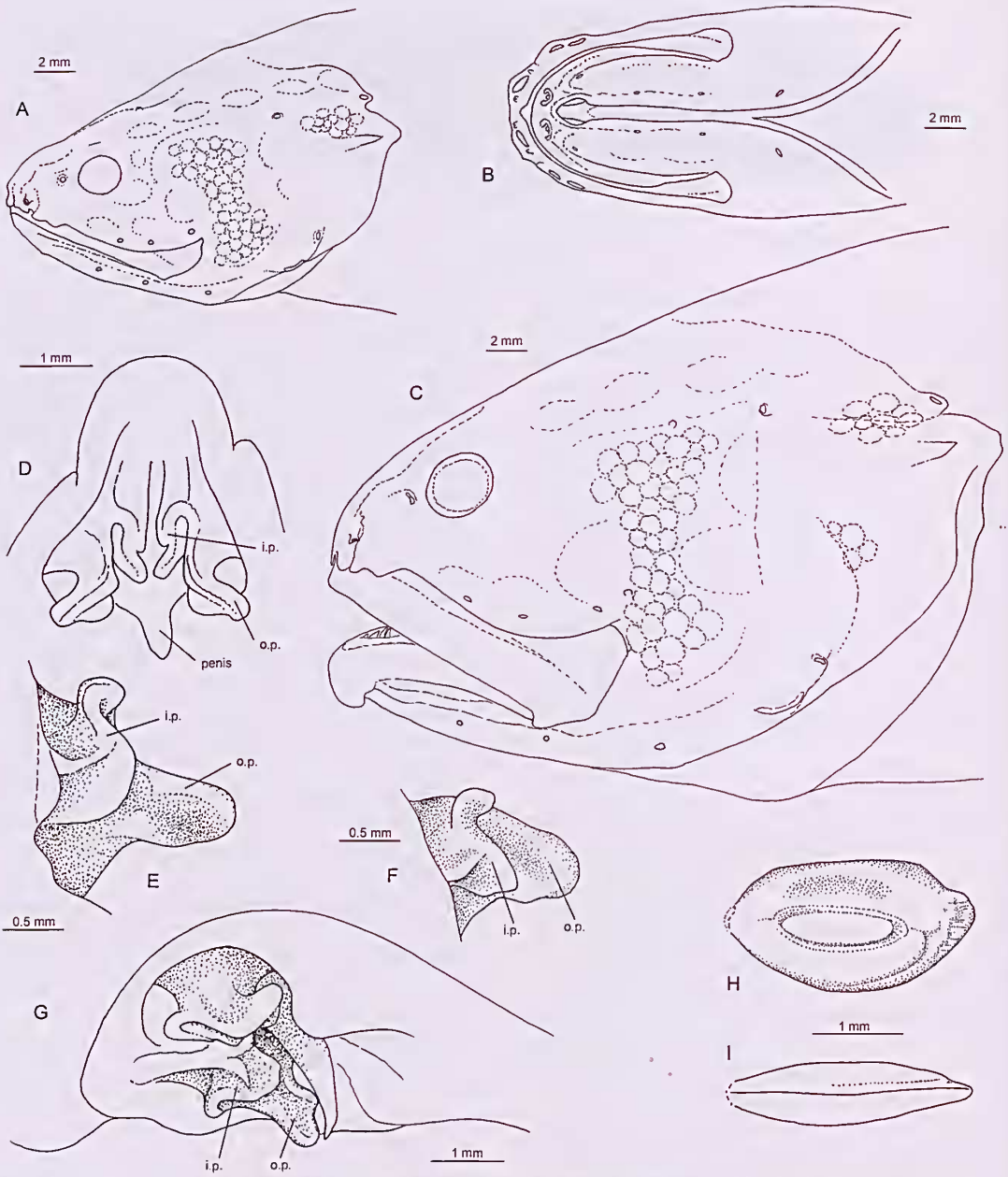

Fig. 56. *Diancistrus novaeguineae* (Machida, 1996). **A**, lateral view of head, ZMUC P 771490, male, 61 mm SL; **B**, ventral view of head, USNM 384600, male, 45 mm SL; **C**, lateral view of head, AMS I. 20547-087, male, 103 mm SL; **D**, ventral view of male copulatory organ, AMS I. 20547-087, male, 103 mm SL; **E**, view of left pseudoclasper from inside, AMS I. 20547-087, male, 103 mm SL; **F**, view of left pseudoclasper from inside, AMS I. 18739-120, male, 76 mm SL; **G**, inclined lateral view of male copulatory organ, AMS I. 20547-087, male, 103 mm SL; **H**, median view of right otolith, holotype; **I**, ventral view of right otolith, holotype.

Comparison. *Diancistrus novaeguineae* belongs to the large group of species with hook- or stick-shaped outer pseudoclaspers, which includes *D. alleni, D. beateae, D. fuscus, D. leisi, D. longifilis, D. machidai, D. manciporus, D. springeri* n. sp. and *D. vietnamensis* n. sp. Of these, *D. alleni, D. beateae, D. fuscus* and *D. vietnamensis* n. sp. seem closest. *Diancistrus beateae* is readily distinguished by the complete scale coverage on the operculum, above and below the opercular spine (versus either above opercular spine only or two separate patches), the higher dorsal fin ray count (84–91 versus 74–85) and differences in the pseudoclaspers. *Diancistrus*

alleni, D. fuscus and *D. vietnamensis* n. sp. all have the same type of pseudoclasper, which differs from that of *D. novaeguineae* in the rectangular offset hook-like extension, which is more slender, and lacks the posterior-distal flap at the inner pseudoclasper. From *D. alleni* it also differs in the higher number of scales above the opercular spine (≥7 versus 1–2, rarely 3). From *D. vietnamensis* n. sp. it differs in the higher number of dorsal fin rays (mostly >77 versus mostly <77), differences in the sulcus proportions of the otolith (otolith length to sulcus length ≤2.0 versus ≥3.0) and the slender head profile (versus high-necked). *Diancistrus fuscus* comes closest, and, although generally with less scales on the operculum (3–7 only above the opercular spine versus 7–16, generally >10, and occasionally with a second patch below opercular spine), distinction between the two species without pseudoclaspers remains uncertain. With present knowledge, however, they do not overlap geographically.

Remarks. Two very large males, the one from the Louisiade Archipelago (AMS I. 20547-087, 103 mm SL), the other the southernmost capture of the species from the Great Barrier Reef, Queensland, Australia (23°S, 151°E) (USNM 372966, 82 mm SL), probably represent stray specimens that, according to the diminutive pseudoclasper proportions, probably grew oversized without becoming ripe. These are also the specimens with the second scale patch on the operculum below the opercular spine (AMS I. 20547-087, Fig. 56 C). Two very large female specimens (77 and 100 mm SL) from Buru do not exhibit such additional scale patch. Outside of the genus *Diancistrus, Dinematichthys megasoma* Machida, 1994, is also known occasionally from very large specimens to have an additional scale patch on the operculum below the opercular spine.

Distribution (Fig. 57). *Diancistrus novaeguineae* is relatively common on the Great Barrier Reef north of 16°S and in Papua New Guinea south of 5°S. Westwards it has been found in Maluku, Indonesia. A few isolated findings in north-western Australia are based on females alone and are tentatively assigned to *D. novaeguineae*. Eastwards it is known along the Louisiade Archipelago to the Solomon Islands including Santa Cruz Islands and Vanuatu.

Diancistrus polupeiensis n. sp.

(Figs 40, 58, 59; Table 27)

Material examined. (5 specimens, 38–82 mm SL). Holotype – USNM 224329, male, 82 mm SL, 07°01'N, 158°13'E, Pohnpei State, Federated States of Micronesia, Lenger Island north of Pohnpei Island, coral reef drop off, 27–46 m, dead coral, V.G. Springer *et al.*, 20 Sept. 1980. Paratypes – USNM 223576, 1 male, 61 mm SL, 06°52'N, 158°06'E, Pohnpei State, Federated States of Micronesia, western coast, coral drop off, V.G. Springer *et al.*, 15 Sept. 1980; USNM 224346, 1 male, 59 mm SL and 2 females, 38–59 mm SL, 06°47'N, 157°54'E, Pohnpei State, Federated States of Micronesia, Pamuk Island, Ant Atoll, drop off, V.G. Springer *et al.*, 16 Sept. 1980.

Fig. 57. Sample sites of *Diancistrus novaeguineae, D. fuscus* and *D. vietnamensis* n. sp. One symbol may represent several samples.

Diagnosis. Vertebrae 11+34–35=45–46, dorsal fin rays 83–85, anal fin rays 66–69; eyes very large (>3.0% SL), D/V 6; outer pseudoclasper large, more than twice the length of inner pseudoelasper, wing-shaped, with moderately narrow base and strongly expanded tip with fleshy bulge; inner pseudoclasper joined to outer pseudoclasper anteriorly, thin, with single sharply pointed tip, slightly extending over anterior part of outer pseudoclasper; moderately broad scale patch on eheek with 5–6 scale rows on upper cheek, 2–3 scales on operculum above opercular spine (1 row); head massive; otolith moderately slender, length to height ratio 1.9–2.0.

Description. The principal meristic and morphometric characters are shown in Table 27. Body moderately compact and moderately high-necked, with massive head, fishes large, probably mature at about 50 mm SL. Head with moderately broad scale patch on cheek with 5–6 scale rows on upper cheek, few scales on operculum above opercular spine (2–3 scales) in 1 row and no seales below opercular spine. Horizontal diameter of body scales 1.6% SL. Maxillaries expanded posteriorly with prominent knob at rear ventral corner. Anterior nostril low on snout, 1/5 distance from tip of snout to anterior margin of eye. Posterior nostril small, with wide funnel-shaped flap, about the size of anterior nostril and about 1/10 thc size of eyc.

Head sensory pores (Fig. 59 A-B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopereular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 5 rows of granular teeth and 2 rows of teeth anteriorly, ineluding one fang-like tooth closest to symphysis. Vomer teeth in 2 rows, including 2–3 fang-like teeth posteriorly. Palatine teeth in 3 rows with 18+10+10 teeth, slightly longer on inner row. Dentary with 7 rows of granular teeth and 2 rows of teeth anteriorly blending into one row of large fang-like teeth posteriorly.

Otolith (Fig. 59 F). Moderately clongate with moderately pointed anterior and posterior tips, length to height 1.9–2.0 (61–82 mm SL); otolith length to sulcus length 2.0; sulcus slightly inclined at 5°.

Table 27. Meristic and morphometrie characters of *Diancistrus pohnpeiensis* n. sp.

	Holotype USNM 224329	Holotype + 4 paratypes Mean (range)	N
Standard length in mm	81	54.3 (37-81)	4*
Meristic characters			
Dorsal fin rays	85	84.0 (83-85)	4
Anal fin rays	67	67.0 (66-69)	4
Pectoral fin rays	18	18.5 (18-19)	2
Preeaudal vertebrae	11	11	5
Caudal vertebrae	34	34.3 (34-35)	4
Total vertebrae	45	45.3 (45-46	4
Rakers on anterior gill arch	19	18.5 (18-19)	2
Pseudobranchial filaments	2	2	3
D/V	6	6	5
D/A	20	20.8 (20-22)	5
V/A	13	13	5
Morphometric characters in % of SL			
Head length	26.9	26.5 (25.8-26.9)	4
Head width	15.2	13.1 (12.0-15.2)	4
Head height	22.3	21.2 (18.9-24.1)	4
Upper jaw length	15.4	14.3 (13.2-15.4)	4
Maxillary height	6.4	5.2 (4.1-6.4)	4
Diameter of pigmented eye	3.3	3.4 (3.1-3.8)	4
Interorbital width	7.4	5.9 (5.3-7.4)	4
Postorbital length	18.1	18.3 (17.8-19.2)	4
Preanal length	52.0	48.9 (46.5-52.0)	4
Predorsal length	35.1	34.3 (33.6-35.1)	4
Body depth at origin of anal fin	20.5	19.1 (18.1-20.5)	4
Pectoral fin length	13.3	14.9 (13.3-16.5)	2
Pelvie fin length	22.0	22.2 (20.8-23.0)	4
Base pelvic fin - anal fin origin	27.0	26.9 (24.9-29.3)	4

* Tail broken in one paratype

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–8 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, nearly reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 59 C-E). Two pairs of large pseudoclaspers. Outer pseudoelasper large, more than 2 times thc length of inner pseudoclasper, wing-shaped, with moderately narrow base, with broad supporter and strongly expanded tip with fleshy bulge; inner pseudoclasper joined

Fig. 58. *Diancistrus pohnpeiensis* n. sp.-Holotype. USNM 224329, male, 82 mm SL.

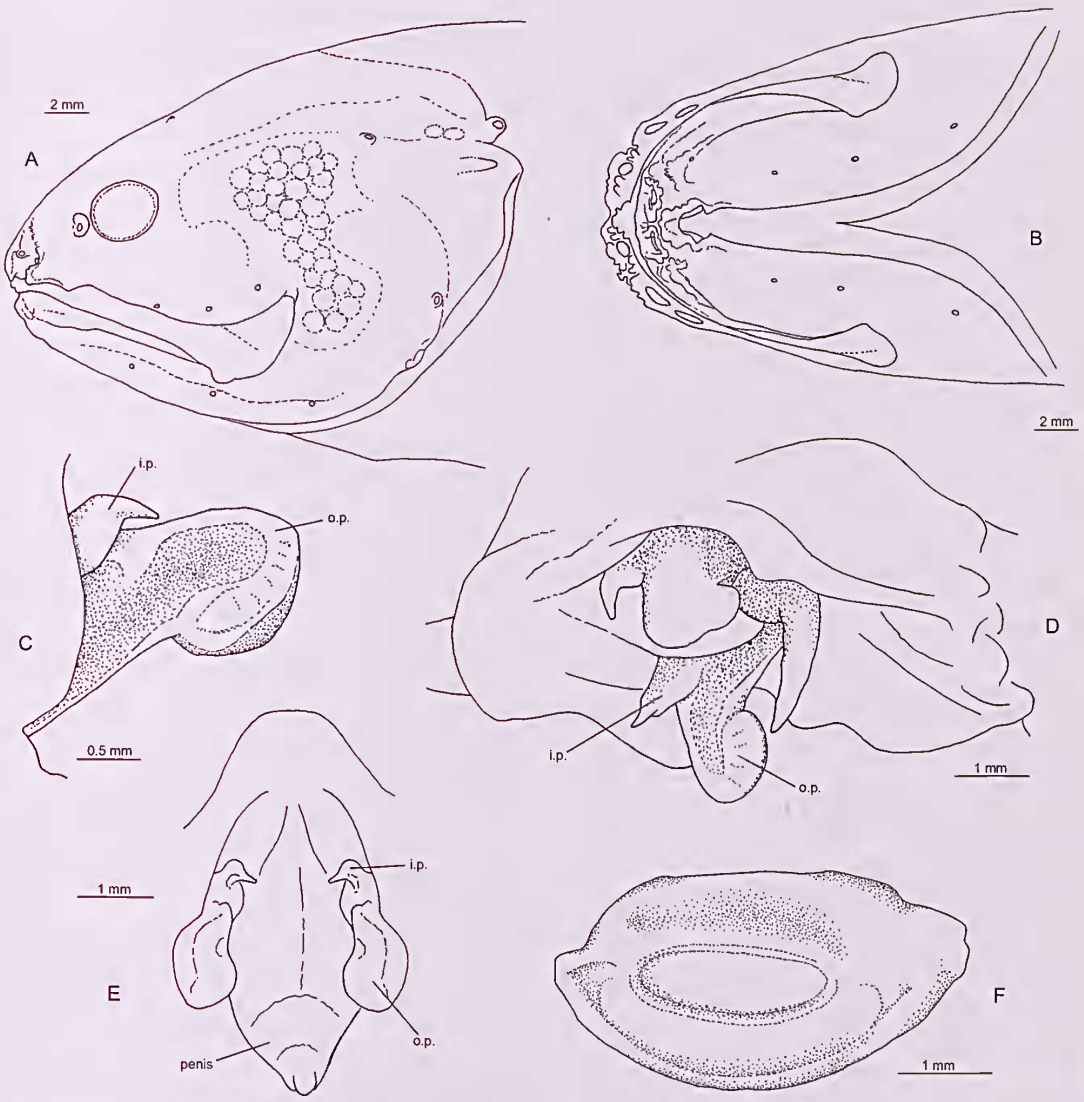

Fig. 59. *Diancistrus pohnpeiensis* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, view of left pseudoclasper from inside, holotype; **D**, inclined lateral view of male copulatory organ, holotype; **E**, ventral view of male copulatory organ, holotype; **F**, median view of right otolith, USNM 223576, male, 61 mm SL.

to outer pseudoclasper anteriorly, thin, with single sharply pointed tip, slightly extending over anterior part of outer pseudoclasper. Isthmus between pseudoclaspers wide. Penis short, curved, with broad base and thin pointed tip.

Coloration. Live colour not known. Uniformly light brown when preserved.

Comparison. *Diancistrus pohnpeiensis* belongs to the group with wing-shaped outer pseudoclasper and a single-tipped inner pseudoclasper, and within this group it most closely resembles *D. eremitus*. *Diancistrus pohnpeiensis* differs in the presence of a fleshy bulge posteriorly at the outer pseudoclasper, 2–3 scales above the opercular spine in a single row (versus 4–5 in 2 rows) and the number of vertebrae (45–46 versus 42–44).

In Pohnpei, *D. pohnpeiensis* occurs associated with *D. karinae*, which is easily distinguished by its complete squamation of the operculum above and below the opercular spine.

Distribution (Fig. 40). *Diancistrus pohnpeiensis* seems to be endemic to the Pohnpei State of the northern-central Caroline Island chain. It appears to be allopatric with *D. eremitus* from the Hermit and Stewart Islands and Fiji further south and with *D. mennei* from the Marshall and (possibly) Kiribati Islands.

Etymology. Named after the type locality, Pohnpei.

Diancistrus robustus n. sp.

(Figs 17, 60, 61; Table 28)

Material examined. (1 specimen, 52 mm SL). HOLOTYPE – USNM 374201, male, 52 mm SL, 17°44'S, 177°17'E, Fiji, Nadi Bay between Malolo Island and Viti Levu, coral and rock at 0–8 m, V.G. Springer *et al.*, 25 May 1982.

Diagnosis. Vertebrae 11+32=43, dorsal fin rays 77, anal fin rays 63; eyes very small (1.8% SL); outer pseudoclasper with short, small ear-lobe extension, opening towards anterior; inner pseudoclasper firmly joined to outer pseudoclasper anteriorly, with supporter, forming a robust thorn, almost as long as outer pseudoclasper; narrow scale patch on cheek, no scales on operculum; head profile massive (width 16.6% SL) with blunt snout.

Description. The principal meristic and morphometric characters are shown in Table 28. Body compact, with blunt snout and undulating dorsal head profile; fishes mature at more than 50 mm SL. Head with narrow scale patch on cheek with up to 4 scale rows on upper cheek, no scales on operculum. Horizontal diameter of body scales 1.7% SL. Maxillaries slightly expanded posteriorly, broadly rounded postventrally. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril large, with prominent funnel-shaped flap around, about twice the size of anterior nostril and about 1/4 the size of eye.

Head sensory pores (Fig. 61 A-B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 5 rows of granular teeth and 1 tooth row anteriorly, about 6 rows of granular teeth posteriorly. Largest teeth about 1/2 pupil diameter. Vomer teeth in 3 rows anteriorly, 2 rows posteriorly. Palatine teeth in 3 rows anteriorly and 2 rows posteriorly, teeth of equal size. Dentary with 6 rows of granular teeth and 1 tooth row anteriorly, blending into one row with about 10 large fang-like teeth posteriorly.

Otolith. Not known.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–9 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, but not reaching tip of last preeaudal parapophysis.

Table 28. Meristic and morphometric characters of *Diancistrus robustus* n. sp.

	Holotype USNM 374201
Standard length in mm	52
Meristic characters	
Dorsal fin rays	77
Anal fin rays	63
Pectoral fin rays	20
Preeaudal vertebrae	11
Caudal vertebrae	32
Total vertebrae	43
Rakers on anterior gill arch	16
Pseudobranchial filaments	2
D/V	6
D/A	18
V/A	13
Morphometric characters in % of SL	
Head length	28.4
Head width	16.6
Head height	20.2
Upper jaw length	14.6
Maxillary height	4.7
Diameter of pigmented eye	1.8
Interorbital width	8.1
Postorbital length	22.1
Preanal length	47.8
Predorsal length	31.3
Body depth at origin of anal fin	21.5
Pectoral fin length	17.9
Pelvic fin length	19.8
Base pelvic fin - anal fin origin	24.6

Male copulatory organ (Fig. 61 C-E). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper ear-lobe shaped, short small ear-lobe extension opening towards anterior; inner pseudoclasper firmly joined to outer pseudoclasper anteriorly, with supporter, forming a robust thorn, almost as long as outer pseudoclasper. Isthmus between pseudoclaspers moderately wide. Penis short, curved, slender.

Coloration. Live colour not known. Uniformly dark brown when preserved.

Fig. 60. *Diancistrus robustus* n. sp. Holotype. USNM 374201, male, 52 mm SL.

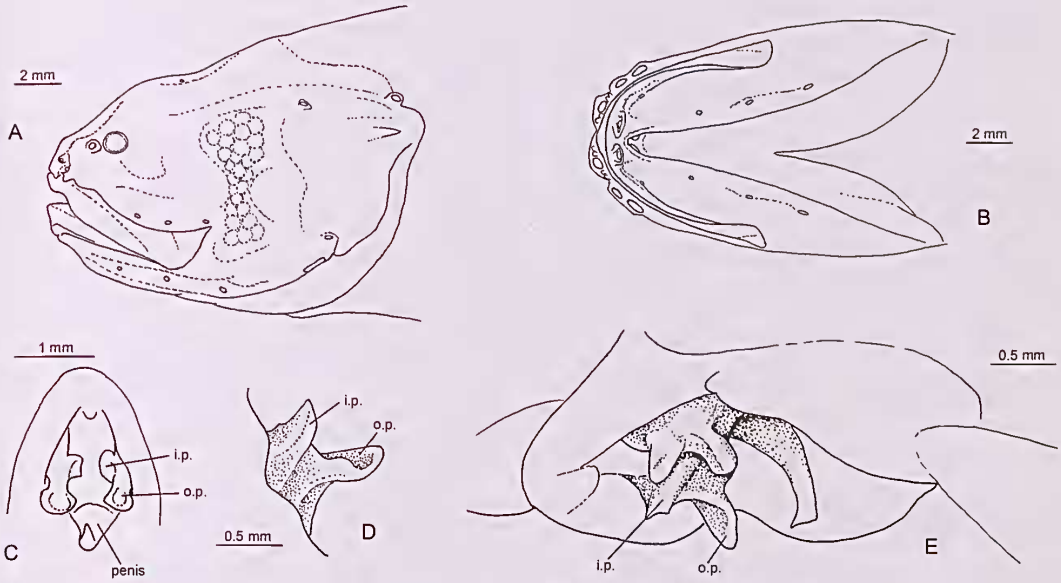

Fig. 61. *Diancistrus robustus* n. sp. Holotype. **A**, lateral view of head; **B**, ventral view of head; **C**, ventral view of male copulatory organ; **D**, view of left pseudoclasper from inside; **E**, inclined lateral view of male copulatory organ.

Comparison. *Diancistrus robustus* belongs to the group of species with ear-lobe shaped outer pseudoclaspers and small eyes (*Diancistrus erythraeus* subgroup) including *D. atollorum, D. erythraeus, D. mcgroutheri* and *D. tongaensis* n. sp. From all other species in the group, *D. robustus* is readily distinguished by the high number of vertebrae (43 versus 39–41, rarely 42), the massive head with the blunt snout (head width 16.6% SL versus ≤16.5% SL, mostly <15%) and the specific shape of the pseudoclaspers. In respect to the pseudoclaspers it shares the 'firmly joined' state of outer and inner pseudoclaspers with *D. atollorum* and *D. erythraeus*. The pseudoclasper pattern of *D. robustus* also resembles that of *D. leisi*, whereby the ear-lobe shaped outer pseudoclasper in the former is much reduced and in the latter the outer pseudoclasper is simple and stick-like.

Diancistrus robustus co-occurs with another species of the group, *D. tongaensis* n. sp.

Distribution (Fig. 17). *Diancistrus robustus* is known from a single specimen from Fiji, Viti Levu Island.

Etymology. Named after the massive head – *robustus* (Latin) = robust.

Diancistrus springeri n. sp.

(Figs 20, 62, 63; Table 29)

Material examined. (9 specimens, 20–48 mm SL). Holotype – AMS I. 34501-023, male, 35 mm SL, 08°34'S, 122°11'E, off Wailiti, Flores, 10–12 m, R. Kuiter *et al.*, 22 Nov. 1993. Paratypes – AMS I. 40161-016, 1 male, 35 mm SL and 3 females, 25–48 mm SL, 13°10'N, 120°35'E, Mindoro, Philippines, 3 June 2000; USNM 263695, 1 male, 42 mm SL, 1 female, 26 mm SL and 2 juveniles, 20–23 mm SL, 09°55'N, 123°20'E, Tanon Strait, Cebu Island west coast, Philippines, J. Libbey *et al.*, 7 May 1979.

Diagnosis. Vertebrae 11+33–34=44–45, dorsal fin rays 78–84, anal fin rays 62–71; eyes large (2.9–3.8% SL); outer pseudoclasper short, only slightly longer than inner pseudoclasper, stick-shaped, slightly anteriorly inclined; inner pseudoclasper joined to outer pseudoclasper by a thin ligament, thin, spiny, strongly forwardly inclined, anteriorly connected by thin ligament to isthmus between pseudoclaspers; broad scale patch on cheek with 5–6 scale rows on upper cheek, large scale patch on operculum above opercular spine with 7–8 scales in 2–3 rows; head slender; otolith length to height ratio about 1.9.

Description. The principal meristic and morphometric characters are shown in Table 29. Body and head slender, snout pointed; fishes small, mature at about 35 mm SL. Head with broad scale patch on cheek with 5–6 scale rows on upper cheek, large scale patch on opercular spine with 7–8 scales in 2–3 rows. Horizontal diameter of body scales 1.8% SL. Maxillaries expanded posteriorly with prominent angle at rear ventral corner. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril small, with funnel-shaped flap, about the size of anterior nostril and less than 1/8 the size of eye.

Head sensory pores (Fig. 63 A-B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 5 rows of granular teeth and 1 tooth row anteriorly, about 5 rows of

Table 29. Meristic and morphometric characters of *Diancistrus springeri* n. sp.

	Holotype AMS I. 34501-023	Holotype + 8 paratypes Mean (range)	N
Standard length in mm	35	31.6 (20-48)	9
Meristic characters			
Dorsal fin rays	78	81.0 (78-84)	7
Anal fin rays	66	65.7 (62-71)	7
Pectoral fin rays	18	17.4 (16-19)	7
Precaudal vertebrae	11	11	7
Caudal vertebrae	33	33.3 (33-34)	7
Total vertebrae	44	44.3 (44-45)	7
Rakers on anterior gill arch	15	15.4 (15-17)	7
Pseudobranchial filaments	2	2	7
D/V	6	6.4 (6-7)	7
D/A	19	20.3 (19-22)	7
V/A	13	13.1 (13-14)	7
Morphometric characters in % of SL			
Head length	27.0	27.3 (26.3-28.5)	6
Head width	12.0	13.1 (11.1-14.7)	7
Head height	16.6	16.9 (15.9-18.3)	7
Upper jaw length	12.6	13.0 (12.6-13.4)	7
Maxillary height	4.0	4.0 (3.6-4.5)	7
Diameter of pigmented eye	3.3	3.3 (2.9-3.8)	9
Interorbital width	5.9	6.9 (5.9-7.6)	7
Postorbital length	17.7	18.7 (17.7-20.0)	7
Preanal length	48.3	47.2 (45.1-49.2)	7
Predorsal length	34.9	34.7 (34.0-35.3)	7
Body depth at origin of anal fin	18.7	17.9 (16.8-19.0)	7
Pectoral fin length	17.7	17.0 (15.9-17.8)	7
Pelvic fin length	21.8	22.5 (21.3-24.3)	7
Base pelvic fin - anal fin origin	24.9	26.6 (23.9-29.9)	7

granular teeth posteriorly. Largest teeth about 1/4 pupil diameter. Vomer teeth in 2 rows, with the largest teeth on posterior inner row. Palatine teeth about 1/4 pupil diameter, in a single row. Dentary with 5 rows of granular teeth and 1 tooth row anteriorly, blending into one row with about 6 large fang-like teeth posteriorly, fang size up to 1/3 pupil diameter.

Otolith (Fig. 63 G). Moderately elongate with pointed anterior and less pointed posterior tip, length to height about 1.9 (34–41 mm SL); otolith length to sulcus length 2.0–2.1; sulcus slightly inclined at 5°.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–9 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–11. First anal fin pterygiophore elongated, often reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 63 C-F). Two pairs of rather small pseudoclaspers. Outer pseudoclasper short, only slightly longer than inner pseudoclasper, stick-shaped, slightly anteriorly inclined; inner pseudoclasper joined to outer pseudoclasper by a thin ligament, thin, spiny, strongly forwardly inclined, anteriorly connected by a thin ligament to isthmus between pseudoclaspers; both inner and outer pseudoclasper nearly reduced to their respective supporters. Isthmus between pseudoclaspers moderately narrow. Penis moderately short, curved, thin. A good variation of pseudoclaspers from three males is available from *D. springeri*, including a sub-adult specimen.

Coloration. Live colour not known. Uniformly light brown when preserved.

Comparison. Within the large group of species with hook- or stick-shaped outer pseudoclaspers, *D. springeri* belongs to the smaller group with the stick-shaped ones, together with *D. leisi*, from which it differs in eye diameter >2.8% versus <2.0% SL), the presence of scales above the opercular spine (versus absent), the total number of vertebrae (44–45 versus 41) and dorsal fin rays (78–84 versus 69–73). The very peculiar pseudoclasper pattern distinguishes *D. springeri* from the many other *Diancistrus* species occurring along the reefs of the southern Philippines and eastern Indonesia. Distinction of females has to rely on head scale counts, meristic counts and morphometric measurements and could be difficult in respect to other *Diancistrus* species with a large scale patch above the opercular spine, such as *D. fuscus*, with which it may co-occur in the Philippines, and *D. novaeguineae*, with which it could overlap in Indonesia.

Distribution (Fig. 20). *Diancistrus springeri* is known from only few specimens widely distributed from 08°S-12°N and 122°E-121°E, in southern Indonesia and the Philippines.

Etymology. Named in honour of Victor G. Springer, Washington, U.S.A., in recognition of his many contributions to the knowledge of the fishes of the Pacific.

Fig. 62. *Diancistrus springeri* n. sp. Holotype. AMS I. 34501-023, male, 35 mm SL.

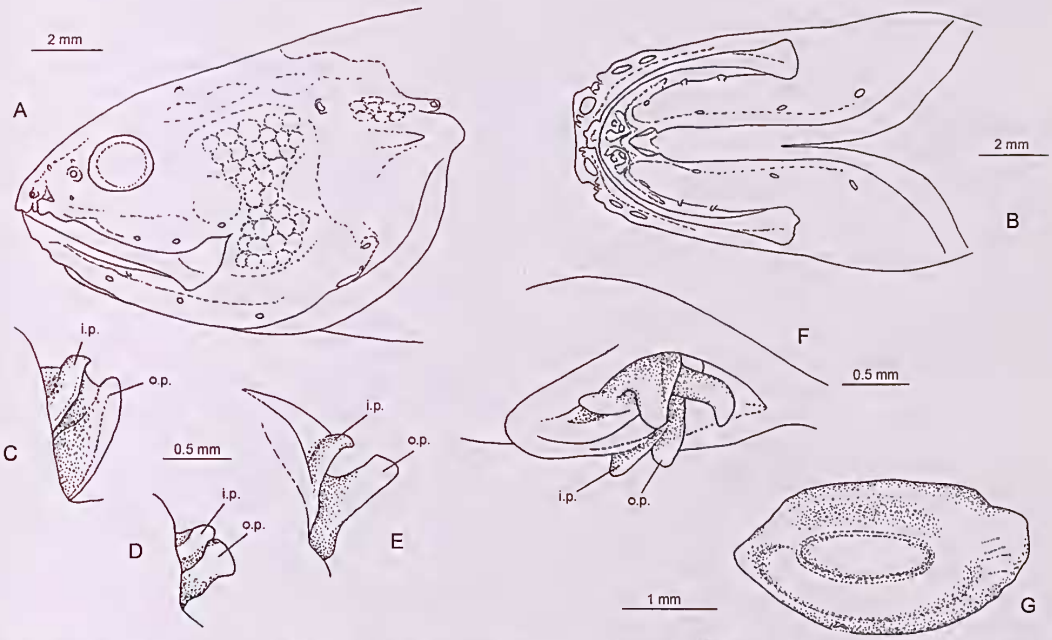

Fig. 63. *Diancistrus springeri* n. sp. **A**, lateral view of head, USNM 263695, male, 42 mm SL; **B**, ventral view of head, USNM 263695, male, 42 mm SL; **C**, view of left pseudoclasper from inside, USNM 263695, 42 mm SL; **D**, view of left pseudoclasper from inside, AMS I. 40161-016, 35 mm SL; **E**, view of left pseudoclasper from inside, holotype; **F**, inclined lateral view of male copulatory organ, holotype; **G**, median view of right otolith, USNM 263695, male, 42 mm SL.

Diancistrus tongaensis n. sp.

(Figs 17, 64, 65; Table 30)

Material examined. (30 specimens, 27–58 mm SL). Holotype – USNM 350484, male, 43 mm SL, 16°47'S, 168°21'E, Epi Island, Vanuatu, surge channel through fringing reef with volcanic sand at bottom, 1–10 m, J. T. Williams *et al.*, 16 June 1996. Paratypes – AMS I. 373339-076, 1 female, 36 mm SL, 16°47'S, 168°21'E, Epi Island, Vanuatu, 16 June 1996; USNM 222480, 1 male, 42 mm SL and 2 females, 50–58 mm SL, Tutuila Island, American Samoa, R.C. Wass; USNM 334547, 1 female, 59 mm SL, 21°20'S, 174°58'W, E'ua Island, Tonga, J. T. Williams *et al.*, 2 Nov. 1993; USNM 334548, 1 female, 31 mm SL, 21°20'S, 174°58'W, E'ua Island, Tonga, J. T. Williams *et al.*, 2 Nov. 1993; USNM 336508, 1 female, 27 mm SL, 19°51'S, 174°25'W, Ha'apai Group, Tonga, J. T. Williams *et al.*, 11 Nov. 1993; USNM 338466, 2 males, 35–38 mm SL and 3 females, 34–58 mm SL, 18°44'S, 174°06'W, Vava'u Islands, Tonga, J. T. Williams *et al.*, 17 Nov. 1993; USNM 338982, 1 female, 37 mm SL, 20°S, 166°E, Ouvea Atoll, Loyalty Islands; USNM 374194, 2 males, 40–45 mm SL, 18°58'S, 179°52'W, Tovu Atoll, Fiji, V.G. Springer *et al.*, 27 April 1982; USNM 374198, 2 males, 38–41 mm SL, 20°34'S, 166°14'E, Ouvea Atoll, Loyalty Islands, J. T. Williams *et al.*, 16 Nov. 1991; USNM 374200, 2 females, 43–46 mm SL, 21°01'S, 175°07'W, Malinoa Island, Tonga, J. T. Williams *et al.*, 27 Oct. 1993; USNM 384602, 1 female, 35 mm SL, same data as holotype; ZMUC P 771488, 1 male, 33 mm SL and ZMUC P 771489, 1 female, 43 mm SL, same data as USNM 338466.

Additional specimens. AMS I. 17473-029, 1 male, 41 mm SL, 17°S, 168°E, Efate Island, Vanuatu; AMS I. 18438-015, 1 female, 49 mm SL, Fiji.

Tentatively assigned specimens. BPBM 8376, 1 female, tail broken, Popoti Bay, Tahiti, Society Islands, French Polynesia, Banner and J.E. Randall, 22 Feb. 1969; USNM 363339, 1 female, 51 mm SL, 13°04'S, 167°39'E, Banks Islands, Vanuatu, J. T. Williams *et al.*, 18 May 1997; USNM 365842, 1 female, 58 mm SL, 11°42'S, 166°50'E, Vanikolo, Santa Cruz Islands, Solomon Islands; USNM 370574, 1 female, 31 mm SL, 13°23'S, 176°11'W, Wallis Island; USNM 374195, 1 female, 40 mm SL, 14°32'S, 168°08'W, Phoenix Islands, Kiribati, L.P. Schultz, 11–12 June 1939.

Diagnosis. Vertebrae 11+(28)29–31=(39) 40–42, dorsal fin rays 71–80, anal fin rays 57–66; eyes small (1.3–2.3% SL); outer pseudoclasper with large ear-lobe extension, ventrally opening; inner pseudoclasper free from outer pseudoclasper, with supporter, forming a broad, distally expanded, not inclined flap, with short thorn; narrow scale patch on cheek, no scales on operculum; head profile slender; otolith length to height ratio 1.9–2.0.

Description. The principal meristic and morphometric characters are shown in Table 30. Body moderately slender;

Table 30. Meristic and morphometric characters of *Diancistrus tongaensis* n. sp.

	Holotype USNM 350484	Holotype + 22 paratypes	N
		Mean (range)	
Standard length in mm	42	40.9 (27-59)	20
Meristic characters			
Dorsal fin rays	77	75.5 (71-80)	19
Anal fin rays	59	59.9 (57-66)	19
Pectoral fin rays	19	20.8 (19-23)	19
Precaudal vertebrae	11	10.9 (10-11)	19
Caudal vertebrae	30	30.3 (29-31)	19
Total vertebrae	41	41.2 (39-42)	19
Rakers on anterior gill arch	16	15.9 (14-18)	17
Pseudobranchial filaments	2	2	17
D/V	6	6	19
D/A	22	20.3 (17-22)	19
V/A	13	12.9 (12-14)	19
Morphometric characters in % of SL			
Head length	27.2	27.8 (26.7-29.3)	19
Head width	12.7	12.9 (10.5-15.6)	18
Head height	16.8	17.7 (16.3-19.8)	19
Upper jaw length	13.6	13.6 (12.5-15.2)	19
Maxillary height	4.4	4.4 (3.7-4.8)	18
Diameter of pigmented eye	1.4	1.8 (1.3-2.3)	18
Interorbital width	7.2	6.7 (4.8-8.0)	19
Postorbital length	21.1	20.6 (19.4-21.8)	19
Preanal length	46.9	47.1 (44.3-50.5)	19
Predorsal length	31.4	32.4 (30.0-34.2)	19
Body depth at origin of anal fin	18.2	18.2 (16.7-19.8)	19
Pectoral fin length	16.7	16.3 (14.4-17.9)	16
Pelvic fin length	26.8	27.7 (25.3-32.4)	15
Base pelvic fin - anal fin origin	27.5	27.3 (24.0-30.0)	19

fishes small, mature at about 40 mm SL. Head with narrow scale patch on cheek with 4–5 scale rows on upper cheek, no scales on operculum. Horizontal diameter of body scales 1.5% SL. Maxillaries expanded posteriorly with prominent angle at rear ventral corner. Anterior nostril low on snout, 1/4 distance from tip of snout to anterior margin of eye. Posterior nostril about twice the size of anterior nostril and about 1/4 the size of eye.

Head sensory pores (Fig. 65 A-B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 4 rows of granular teeth, 1 tooth row anteriorly and about 5 rows of granular teeth posteriorly. Largest teeth about 3/4 pupil diameter. Vomer teeth in 2 rows, largest teeth on posterior inner row. Palatine teeth in 2 rows, with teeth on inner row more than twice as long as on outer row. Dentary with 5 rows of granular teeth and 1 tooth row anteriorly, blending into one row with about 7 large fang-like teeth posteriorly, fang size up to 1/1 pupil diameter.

Otolith (Fig. 65 G-K). Moderately elongate with pointed anterior and expanded posterior tip, length to height 1.9–2.0 (38–58 mm SL); otolith length to sulcus length 2.2–2.3; sulcus not inclined. Dorsal rim of otolith from female specimens (Fig. 65 I-K) gently curved without angles, relatively straight with broad, obtuse pre- and postdorsal angles in males (Fig. 65 G-H). Also otoliths from females are thinner than those of males.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–8 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2–10. First anal fin pterygiophore elongated, not quite reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 65 C-F). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper ear-lobe shaped, large ear-lobe extension ventrally opened; inner pseudoclasper free from outer pseudoclasper, with supporter, forming a broad, distally expanded, not inclined flap, with short thorn, not forwardly inclined or connected with ligament anteriorly. Isthmus between pseudoclaspers moderately wide. Penis short, curved, slender.

Coloration. Live colour not known. Uniformly medium to dark brown when preserved.

Comparison. *Diancistrus tongaensis* belongs to the group of species with ear-lobe shaped outer pseudoclaspers and small eyes (*Diancistrus erythraens* subgroup) including *D. atollorum, D. erythraeus, D. mcgroutheri* and *D. robustus*. Except for *D. robustus,* the species of this subgroup are further characterized by the low number of vertebrae (39–41, rarely 42 versus 43 in *D. robustus*) and the slender head (head width <16% SL versus >16% SL in *D. robustus*). Apparently, *D. tongaensis* is closest to *D. mcgroutheri,* differing in the large, ventrally opening ear-lobe extension of the outer pseudoclasper (versus small and inwardly directed), the broad, distally expanded inner

Fig. 64. *Diancistrus tongaensis* n. sp. Holotype. USNM 350484, male, 43 mm SL.

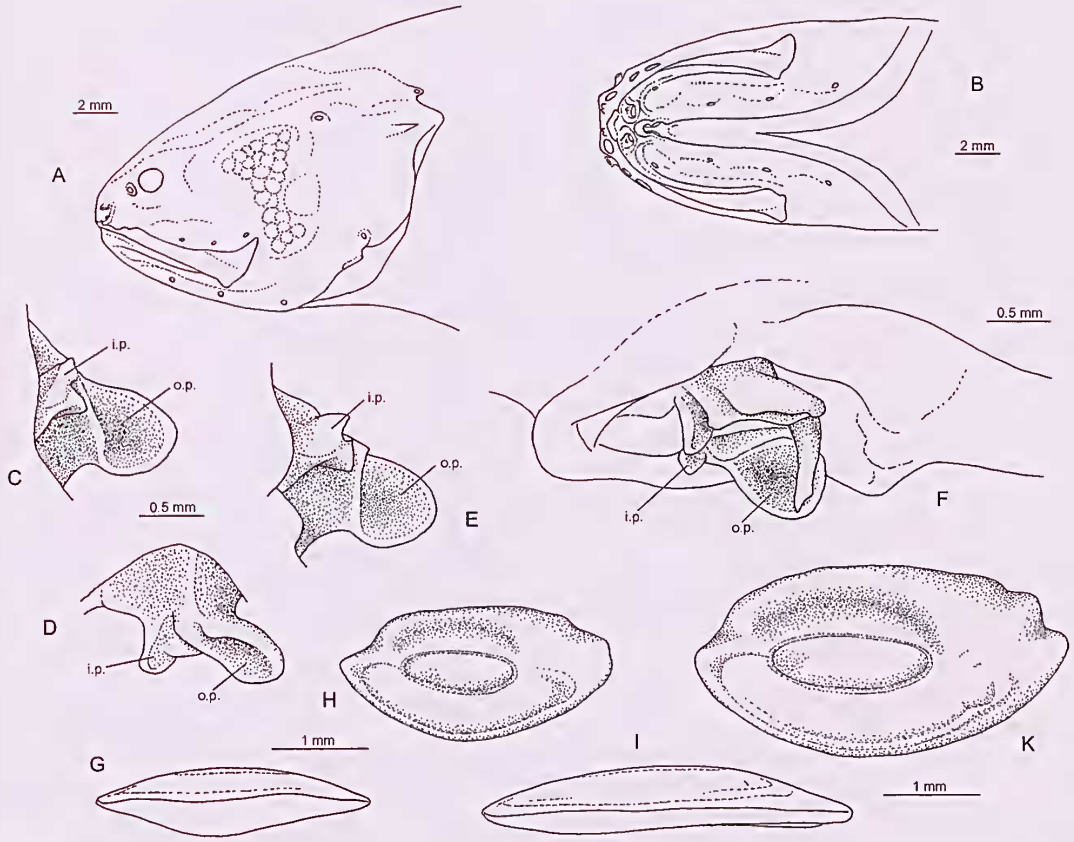

Fig. 65. *Diancistrus tongaensis* n. sp. **A**, lateral view of head, USNM 338466, female, 58 mm SL; **B**, ventral view of head, USNM 338466, female, 58 mm SL; **C**, view of left pseudoclasper from inside, holotype; **D**, view of left pseudoclasper from outside, USNM 338466, 38 mm SL; **E**, view of left pseudoclasper from inside, USNM 338466, 38 mm SL; **F**, inclined lateral view of male copulatory organ, USNM 338466, 38 mm SL; **G**, ventral view of right otolith, USNM 338466, male, 38 mm SL; **H**, median view of right otolith, USNM 338466, male, 38 mm SL; **I**, ventral view of right otolith, USNM 338466, female, 58 mm SL; **K**, median view of right otolith, USNM 338466, female, 58 mm SL.

pseudoclasper (versus thorn-like anteriorly inclined) and the more compressed otoliths (otolith length to height ratio 1.9–2.0 versus 2.0–2.2).

Diancistrus tongaensis co-occurs with *D. robustus* in Fiji (see account). Along its north-western reaches, *D. tongaensis* may possibly overlap in distribution with *D. mcgroutheri,* in which case distinction of the two species would have to rely basically on pseudoclasper analysis.

Distribution (Fig. 17). *Diancistrus tongaensis* is the most easterly distributed species of the *Diancistrus erythraeus* group, known from the Loyalty Islands to southern Vanuatu, Fiji, Tonga and Samoa. Further records from the Santa Cruz Islands (Vanikolo), Vanuatu (Banks Islands), Phoenix Islands (Kiribati), Wallis Island and Tahiti are based on females only and therefore tentatively assigned.

Etymology. Named after Tonga, from where the majority of the investigated specimens have been obtained.

Diancistrus vietnamensis n. sp.

(Figs 57, 66, 67; Table 31)

Material examined. (21 specimens, 52–72 mm SL). Holotype – ROM 71847, male, 69 mm SL, 20°N, 107°E, Tudo Island, Cac Ba Islands, Gulf of Tongking, northern Vietnam, R. Winterbottom, W. Holleman, Hubley, Thuoc, Quan, 7 June 1997. Paratypes – NSMT P. 55824, 1 female, 52 mm SL, Dadonhai, Hainan Island, southern China, K. Matsuura, 1 March 1997; ROM 78117, 4 females, 56–68 mm SL, 20°N, 107°E, Cac Ba Islands, northern Vietnam; ROM 78118, 2 males, 56–62 mm SL, 9 females, 52–72 mm SL and 1 juvenile, 18 mm SL, same data as holotype; ROM 78119, 1 female, 63 mm SL, 20°N, 107°E, Cac Ba Islands, northern Vietnam; ZMUC P 771466, 1 male, 60 mm SL and ZMUC P 771467, 1 female, 62 mm SL, same data as ROM 78118.

Diagnosis. Vertebrae 11+31–33=42–44, dorsal fin rays 69–80 (mostly <77), anal fin rays 58–64, D/V 7–8; eyes moderately large (2.0–2.9% SL); outer pseudoclasper

with hook-shaped extension oriented backward at 90° angle and slightly bent outwards and with rounded tip; inner pseudoclasper short, joined to outer pseudoclasper anteriorly, with supporter, with anterior hook oriented forward at 90° angle and wide thin flap at its base; narrow scale patch on cheek with 4–5 scale rows on upper cheek, 4–5 scales in 2 rows on operculum above opercular spine; head profile high-necked, broad; otolith length sulcus length ≥2.3, sulcus inclined at 5–10°.

Description. The principal meristic and morphometric characters are shown in Table 31. Body compact with high neck in larger specimens, highest just in front of origin of dorsal fin; fishes mature at about 45 mm SL. Head with narrow scale patch on cheek containing 4–5 scale rows on upper cheek, and 4–5 scales on operculum above opercular spine in two rows. Horizontal diameter of body scales 1.3% SL. Maxillaries expanded posteriorly with prominent angle at rear ventral corner. Anterior nostril low on snout, 1/5 distance from tip of snout to anterior margin of eye. Posterior nostril small, the size of anterior nostril and about 1/5 the size of eye.

Head sensory pores (Fig. 67 A-B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior). Preopercular pores 4 (3 lower and 1 upper).

Dentition (of holotype). Premaxilla with 6 rows of granular teeth and 1 tooth row anteriorly, up to 1/3 pupil diameter closest to symphysis. Up to eight rows of granular teeth posteriorly. Vomer teeth in 2 rows, with larger teeth posteriorly. Palatine teeth in 6 irregular rows anteriorly, blending into 2 rows posteriorly, inner row with largest teeth. Dentary with 4 rows of granular teeth and 2 tooth rows anteriorly. About 12 large teeth on inner row.

Otolith (Fig. 67 F-H). Elongate, length to height 2.0–2.1 (56–68 mm SL); otolith length to sulcus length 2.3–2,4; sulcus inclined at 5–10°. Posterior tip of otolith slender, pointed, almost as much as anterior tip.

Axial skeleton (of holotype). Neural spine of vertebrae 4–5 inclined and 6–9 depressed. Parapophyses present from vertebra 7 to 11. Pleural ribs on vertebrae 2- (10) 11. First anal fin pterygiophore elongated, not quite reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 67 C-E). Two pairs of large pseudoclaspers. Outer pseudoclasper with hook-shaped extension oriented backward at 90° angle and slightly bent outwards and with rounded tip; inner pseudoclasper short, joined to outer pseudoclasper anteriorly, with supporter, with anterior hook oriented forward at 90° angle and with wide thin flap at its base. Isthmus between pseudoclaspers narrow. Penis long, rather straight, with broad base and thin tip.

Table 31. Meristic and morphometric characters of *Diancistrus vietnamensis* n. sp.

	Holotype ROM 71847	Holotype + 20 paratypes	N
		Mean (range)	
Standard length in mm	69	59.3 (18-72)	21
Meristic characters			
Dorsal fin rays	75	74.8 (69-80)	19
Anal fin rays	63	60.9 (58-64)	19
Pectoral fin rays	18	18.0 (17-20)	12
Precaudal vertebrae	11	11	19
Caudal vertebrae	32	32.1 (31-33)	19
Total vertebrae	43	43.1 (42-44)	19
Rakers on anterior gill arch	17	15.8 (14-17)	20
Pseudobranchial filaments	2	2	19
D/V	7	7.1 (7-8)	19
D/A	18	18.3 (16-21)	19
V/A	14	13.5 (13-14)	19
Morphometric characters in % of SL			
Head length	28.1	26.4 (24.4-28.1)	20
Head width	13.9	12.7 (11.0-14.3)	10
Head height	22.5	19.6 (18.0-23.9)	15
Upper jaw length	13.9	12.5 (11.5-13.9)	20
Maxillary height	4.8	4.7 (4.1-5.3)	19
Diameter of pigmented eye	2.5	2.4 (2.0-2.9)	21
Interorbital width	6.5	5.4 (4.8-6.5)	17
Postorbital length	19.7	18.6 (16.9-19.8)	20
Preanal length	48.4	49.9 (45.7-54.0)	21
Predorsal length	36.8	33.1 (29.9-37.1)	21
Body depth at origin of anal fin	19.6	18.5 (16.1-21.6)	20
Pectoral fin length	-	16.2 (14.1-18.1)	8
Pelvic fin length	22.8	22.1 (20.2-26.3)	19
Base pelvic fin - anal fin origin	27.8	27.8 (23.6-29.8)	20

Coloration. Live colour not known. Uniformly medium to dark brown when preserved.

Comparison. *Diancistrus vietnamensis* belongs to the large group of species with hook- or stick-shaped outer pseudoclaspers, which further contains the species

Fig. 66. *Diancistrus vietnamensis* n. sp. Holotype. ROM 71847, male, 69 mm SL.

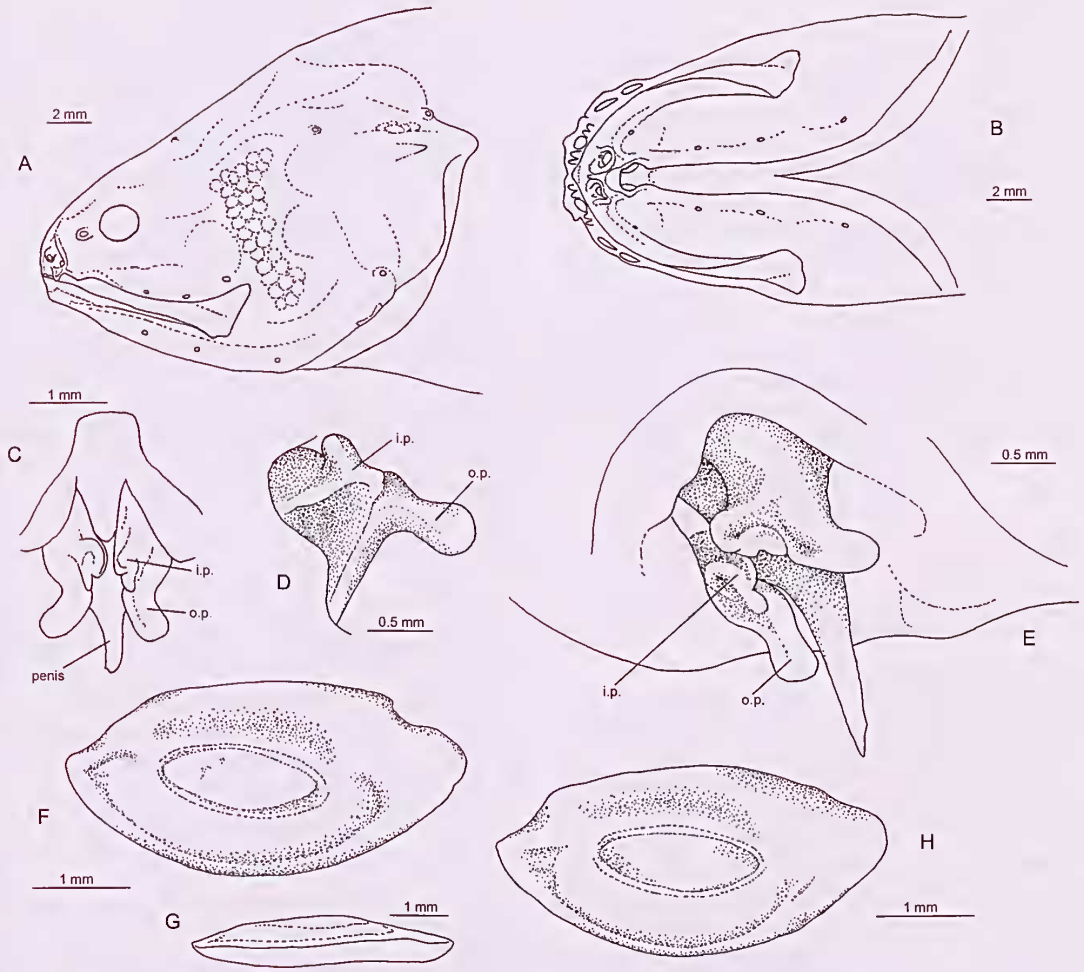

Fig. 67. *Diancistrus vietnamensis* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, ventral view of male copulatory organ, holotype; **D**, view of left pseudoclasper from inside, holotype; **E**, inclined lateral view of male copulatory organ, holotype; **F**, median view of right otolith, holotype; **G**, ventral view of right otolith, holotype; **H**, median view of right otolith, ZMUC P 771467, female, 62 mm SL.

D. alleni, D. beateae, D. fuscus, D. leisi, D. longifilis, D. machidai, D. manciporus, D. novaeguineae and *D. springeri*. Of these, *D. fuscus* clearly is the most similar, and it is likely that *D. vietnamensis* has derived from *D. fuscus* by geographic separation. *Diancistrus vietnamensis* differs from *D. fuscus* in the number of dorsal fin rays (69–80 versus 74–85), the D/V (7 versus 6, rarely 7), the head profile (high neck versus low) and the relative sulcus length (otolith length to sulcus length ≥2.3 versus ≤2.0). Also there is a subtle, though seemingly consistent, difference in the shape of the inner pseudoclasper in *D. vietnamensis* – the 90° forward inclined hook.

The rather low degree of variation of *D. vietnamensis* compared to that of *D. fuscus* is remarkable and may be related to the small and geographically restricted population of *D. vietnamensis*.

Distribution (Fig. 57). *Diancistrus vietnamensis* is known only from northern-most Vietnam (Cat Ba Islands) and adjacent southern-most China with a single record from the Hainan Island.

Etymology. Named after the type-locality, Vietnam.

Diancistrus sp. 1

(Figs 12, 68)

Material examined. (3 specimens, 32–49 mm SL). NON-TYPES: BPBM 40217, 1 female, 49 mm SL, Ishigaki-jima, Ryukyu Islands, J.E. Randall and A.H Banner, 22 May 1968; BPBM 40218, 1 female, 35 mm SL, Ishigaki-jima, Ryukyu Islands, J.E. Randall and A.H Banner, 23 May 1968; NSMT P. 61246, 1 sub-adult male, 32 mm SL, Ishigaki-jima, Ryukyu Islands, K. Matsuura and G. Shinohara, 7 Dec. 1995.

Remarks. Three specimens from the Ryukyu Islands most likely represent an undescribed species characterized by a very slender head with a sharp snout versus rounded in most other *Diancistrus* species, large eyes, a broad scale patch on the cheek and no scales on the operculum (Fig. 68 A-B). The otolith (Fig. 68 C) is elongate (otolith length to height 2.1) and the sulcus is short (otolith length to suleus length 2.4). The combination of large eyes and no scales on the operculum distinguishes it from all other *Diancistrus* species in the area, except for *D. machidai*, which occurs further to the south off the Philippines. It is mainly the peculiar head shape and the higher number of dorsal fin rays (83–89 versus 66–77), which suggest that these specimens represent a species different from *D. machidai*, but we refrain from describing a new species until an adult male is available.

Diancistrus sp. 2

(Figs 40, 69)

Material examined. (1 specimen, 50 mm SL). NON-TYPES: BPBM 13709, 1 male, 50 mm SL, 22°S, 151°W, Rurutu Island, Tubuai Islands, French Polynesia, coral slope at 45–60 m, J.E. Randall, D. Cannoy, R. McNair, D. Devaney and J. Haywood, 28 Feb. 1971.

Remarks. A single, rather small male specimen from the isolated Rurutu Island of the Tubuai Archipelago may represent an undescribed species of the *Diancistrus katrineae* subgroup, characterized by a single-tipped inner pseudoclasper usually extending anteriorly over the outer pseudoclasper, and which includes *D. katrineae, D. eremitus, D. karinae, D. jeffjohnsoni, D. mennei* and *D. pohnpeiensis. Diancistrus* sp. 2 is characterized by a large scale patch on the operculum above the opercular spine (6), the absence of scales below the opercular spine, the slender head and the following pseudoclasper characteristics: moderately large, flat, blade-like outer pseudoclasper with broad base and rounded tip and a stick-like inner pseudoclasper that is strongly inclined anteriorly. The head squamation and pseudoclasper pattern resembles most that of *D. mennei*, but differs in the strong forward inclination of the inner pseudoclasper. However, the small size of the unique specimen may not exhibit fully matured pseudoclasper morphology as indicated by the ontogenetic sequence studied in *D. eremitus* (see account). We therefore have refrained from describing a new species.

Diancistrus sp. 3

(Fig. 17)

Material examined. (2 specimens, 57–66 mm SL). NON-TYPES: USNM 164581, 1 female, 57 mm SL, Indonesia, W. Longley; USNM 366218, 1 female, 66 mm SL, 03°27'S, 100°41'E, Pulo Stupai, Mentawai Island south of Sumatra, Indonesia, R. Bolin and party, 6 Dec. 1963.

Remarks. These two large specimens likely represent a species of the *Diancistrus erythraeus* subgroup characterized by the small eyes and the ear-lobe shaped outer pseudoclaspers. Since they are both females and have been obtained far away from any species of this group so far recorded, they cannot be associated with reasonable certainty to one of them. Also, when reminding the geographical distribution ranges of the various species of the *Diancistrus erythraeus* group, it is quite possible that these two specimens represent yet a further species. The species of that group with the most nearby records are *D. mcgroutheri* from north-east Australia and *D. erythraeus* from the Philippines.

Paradiancistrus n. gen.

(Tables 2–4)

Type species: *Paradiancistrus acutirostris* n. sp. (type locality: southern coast of Epi Island, Vanuatu, 16°47'S, 168°21'E).

Diagnosis. Anterior nostril placed low on snout; male copulatory organ with two pairs of small pseudoclaspers, the outer broad and wing-shaped, the inner joined anteriorly to the outer pseudoclasper forming a u-shaped

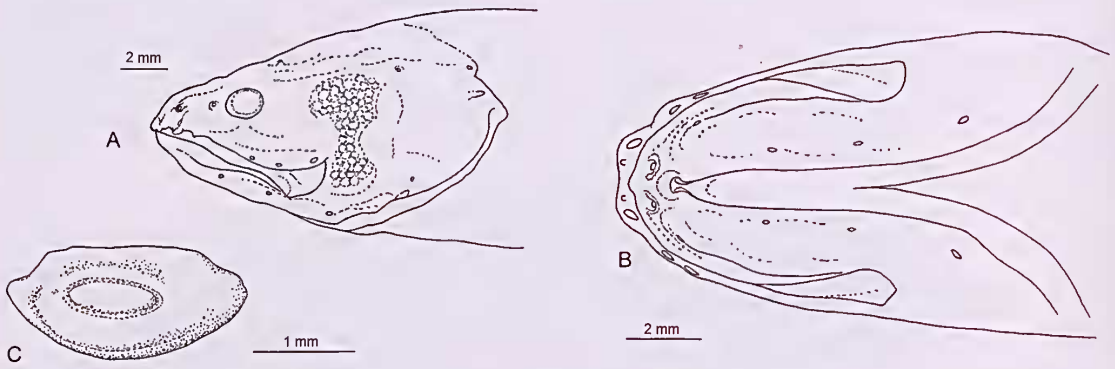

Fig. 68. *Diancistrus* sp. 1. **A**, lateral view of head, BPBM 40217, female, 49 mm SL; **B**, ventral view of head, BPBM 40217, female, 49 mm SL; **C**, median view of right otolith, NSMT P. 61246, sub-adult male, 32 mm SL.

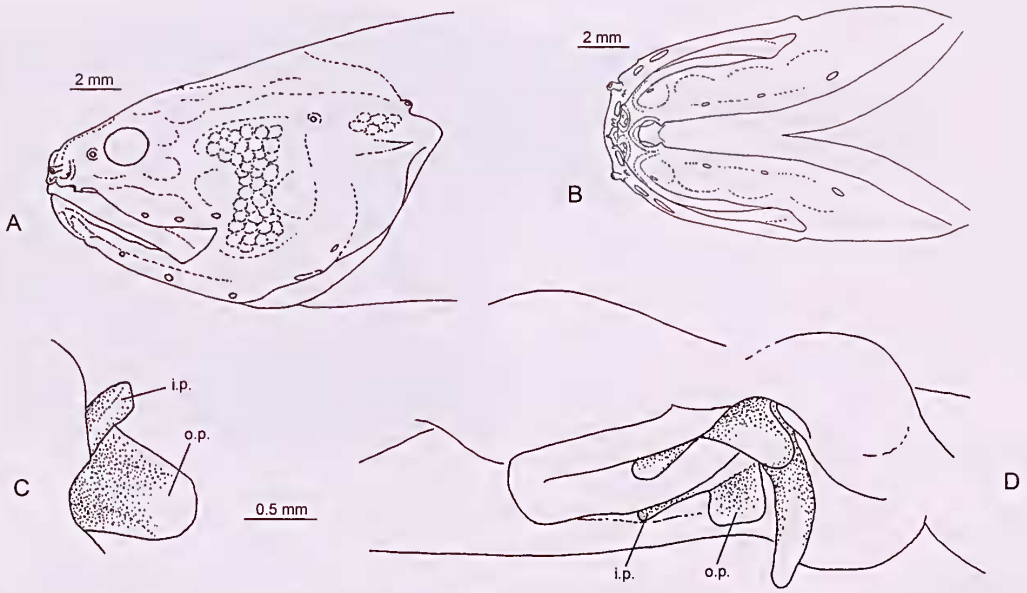

Fig. 69. *Diancistrus* sp. 2. BPBM 13709, male, 50 mm SL. **A**, lateral view of head; **B**, ventral view of head; **C**, view of left pseudoclasper from inside; **D**, inclined lateral view of male copulatory organ.

feature, with supporter; eyes large (2.4–3.1% SL); lower preopercular pores 1; precaudal vertebrae 11; parapophyses very wide; head with narrow scale patch on cheek, no scales on operculum; otolith with inclined (5–10°) and short sulcus (otolith length to suleus length 2.4–2.6), colliculi fused; maxillary expanded at rear corner; anterior anal fin pterygiophore long.

Comparison. *Paradiancistrus* belongs to the dinematichthyine genera characterized by a combination of a low anterior nostril, two pairs of pseudoclaspers, maxillary expanded at the rear corner and an otolith with fused colliculi. It is distinguished from most other Indo-West Pacific genera so far described – *Beaglichthys, Brosmolus, Dermatopsis, Dermatopsoides, Dinematichthys s.l.*, *Dipulus* and *Monothrix* – by the characters listed previously in the generic diagnoses of *Brotulinella* and *Diancistrus*. These three genera seem to form a natural group mainly differing in their pseudoclasper pattern. *Paradiancistrus* further differs from *Brotulinella* in the number of precaudal vertebrae (11 versus 12) and the otolith with the short sulcus (otolith length to suleus length 2.4–2.6 versus 2.2–2.4). The latter character also distinguishes *Paradiancistrus* from *Diancistrus*. The most important diagnostic character of *Paradiancistrus* however, is the presence of only 1 lower preopercular pore (versus 3) distinguishing it from all other dinematichthyine genera except for the recently described *Pseudogilbia* Møller, Schwarzhans and Nielsen, 2004, from the tropical West Atlantic off Panama. *Paradiancistrus*, however, shows a very different pseudoclasper arrangement from *Pseudogilbia* (though also with two pairs), a more slender head (head length >27% SL versus <26% SL, head height >20% SL versus <17% SL) and smaller eyes (≤3.1% SL versus >4% SL).

Species. The genus contains two species described as new – *P. acutirostris* from Vanuatu and *P. cryoensis* from the Visayan and Palawan Islands of the Philippines.

Etymology. The name refers to the most similar genus *Diancistrus*. Gender: male.

Paradiancistrus acutirostris n. sp.

(Figs 70, 71, 72; Table 32)

Material examined. (2 specimens, 36–47 mm SL). Holotype – USNM 359969, male, 36 mm SL, 16°47'S, 168°21'E, Makura Island, Shepherd Islands, Vanuatu, reef with sand at its base at 20–22 m, J.T. Williams *et al.*, 17 June 1996. Paratype – USNM 372969, 1 female, 47 mm SL, 15°00'S, 168°03'E, north-western coast of Maewo Island, Vanuatu, near shore rocky reef at 2–8 m, J. T. Williams *et al.*, 25 May 1997.

Diagnosis. Vertebrae 11+32–33=43–44, dorsal fin rays 82–88, anal fin rays 66–71; eyes large (2.6–3.1% SL); lower preopercular pores 1; outer pseudoclasper broad and wing-shaped, short, blunt; inner pseudoclasper a double winged broad flap, anteriorly joined to outer pseudoclasper forming a u-shaped feature, with supporter; very narrow scale patch on anterior part of cheek only with 2 scale rows on upper cheek and single scale row on lower cheek; head profile slender, with sharp, pointed snout.

Table 32. Meristic and morphometric characters of *Paradiancistrus acutirostris* n. sp.

	USNM 359969 Holotype	USNM 372969 Paratype
Standard length in mm	35 male	46 female
-		
Dorsal fin rays	88	82
Anal fin rays	71	66
Pectoral fin rays	-	-
Precaudal vertebrae	11	11
Caudal vertebrae	32	33
Total vertebrae	43	44
Rakers on anterior gill arch	16	18
Pseudobranchial filaments	2	2
D/V	6	7
D/A	22	18
V/A	13	13
Morphometric characters in % of SL		
Head length	28.6	28.9
Head width	11.7	11.7
Head height	20.0	20.9
Upper jaw length	15.1	13.3
Maxillary height	-	5.0
Diameter of pigmented eye	3.1	2.6
Interorbital width	4.9	5.4
Postorbital length	19.4	20.0
Preanal length	49.7	45.7
Predorsal length	36.6	36.3
Body depth at origin of anal fin	18.6	18.7
Pectoral fin length	15.7	15.7
Pelvic fin length	-	-
Base pelvic fin - anal fin origin	28.0	23.7

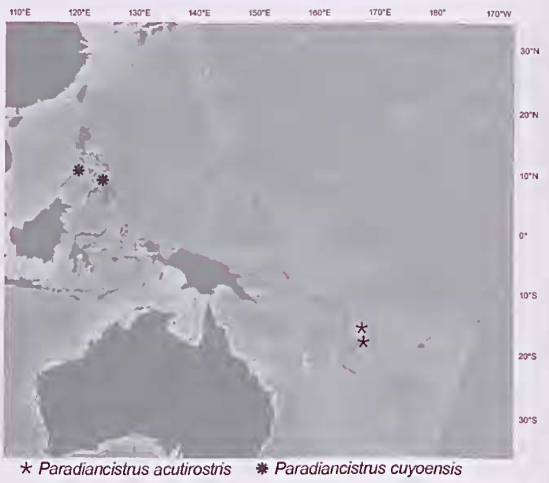

Fig. 70. Sample sites of *Paradiancistrus acutirostris* n. sp. and *P. cuyoensis* n. sp.

Description. The principal meristic and morphometric characters are shown in Table 32. Body slender with sharp, pointed snout; fishes mature at about 35 mm SL. Head with very narrow scale patch on cheek (2 scale rows on upper and 1 on lower cheek); no scales on operculum. Horizontal diameter of body scales 1.9% SL. Maxillary ending far behind eyes, dorsal margin covered by dermal lobe of upper lip, expanded posteriorly, with prominent angle at ventral rear corner. Anterior nostril placed low on snout, close to the upper lip, less than 1/5 distance from tip of snout to anterior margin of eye. Posterior nostril small, about the size of anterior nostril and 1/6 the size of eye. Tip of opercular spine free, pointed. Anterior gill arch with 16–18 rakers, thereof 3 elongated rakers in an uninterrupted row at the angle. Pseudobranchial filaments 2. Dorsal fin originates at about 1/3 from body length, predorsal 36–37% SL; anal fin origin at about mid-body, preanal 46–50% SL; distance pelvic fin base to anal fin base 24–28% SL. Caudal fin free, rounded.

Head sensory pores (Fig. 72 A-B). Supraorbital pores 3; 1st anterior pore larger than anterior infraorbital pores and not associated by cirri on either side. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior); 1st anterior pore associated with long single cirrus in front. Preopercular pores 2 (1 lower and 1 upper), both tubular.

Dentition (of holotype). Premaxilla with 3 rows of granular teeth and 1 tooth row anteriorly, up to 2/3 pupil diameter closest to symphysis. Up to 5 rows of granular teeth posteriorly. Vomer teeth in 2 rows, with the larger teeth posteriorly. Palatine teeth in 2 rows, with teeth on inner row twice as long as on outer row. Dentary with 3 rows of granular teeth and 1 tooth row anteriorly. About 5 large teeth on inner row in total, up to 3/4 of pupil diameter.

Otolith (Fig. 72 C-D). Moderately elongate, length to height 2.0 (36 mm SL); otolith length to sulcus length 2.4; sulcus inclined at 5°. Anterior and posterior tips of otolith pointed, dorsal rim straight.

Axial skeleton (of holotype). Neural and haemal spines slender, except for neural spines of vertebrae 4–5 inclined and 6–7 depressed, shorter in length than spines of 2nd-5th vertebrae. Bases of neural spines 5–8 enlarged. Parapophyses present from vertebra 7 to 11, very wide. Pleural ribs on vertebrae 2–10, absent on last precaudal vertebra. Epipleural ribs indistinct. First anal fin pterygiophore elongated, almost reaching tip of last preeaudal parapophysis.

Male copulatory organ (Fig. 72 E-F). Two pairs of rather small pseudoclaspers. Outer pseudoclasper broad, wing-shaped, short, blunt, with thick and broad supporter; inner pseudoclasper double-winged broad flap, the two wings difficult to see because they face inner side of outer pseudoclasper, anteriorly joined to outer pseudoclasper to form curved feature, with small supporter. Isthmus between pseudoclaspers moderately wide. Penis short, curved, with broad base and tip.

Coloration. Live colour not known. Uniformly medium brown when preserved.

Fig. 71. *Paradiancistrus acutirostris* n. sp. Holotype. USNM 359969, male, 36 mm SL.

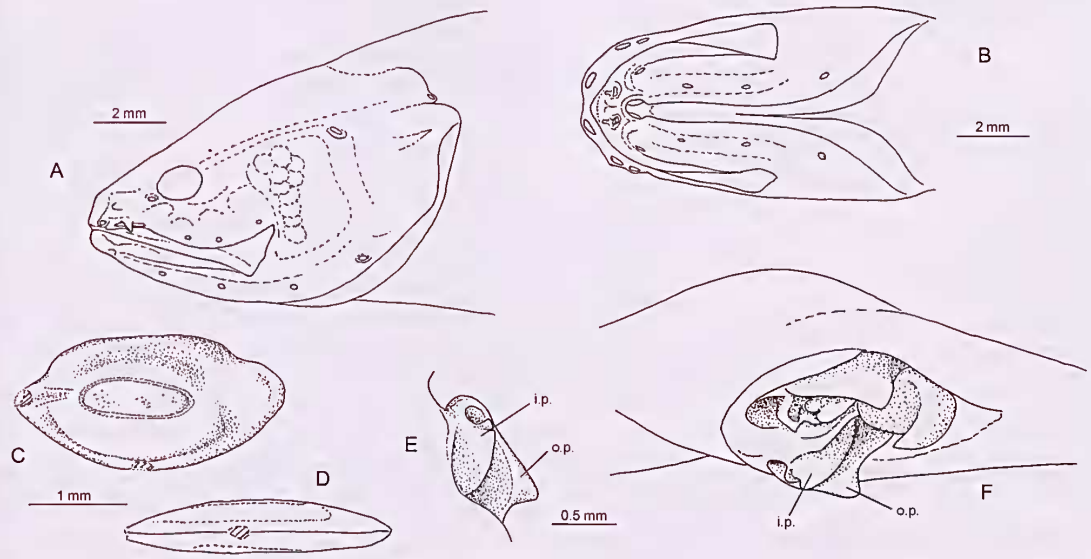

Fig. 72. *Paradiancistrus acutirostris* n. sp. Holotype. **A**, lateral view of head; **B**, ventral view of head; **C**, median view of right otolith; **D**, ventral view of right otolith; **E**, view of left pseudoclasper from inside; **F**, inclined lateral view of male copulatory organ.

Comparison. *Paradiancistrus acutirostris* differs from the other species of this genus, *P. cuyoensis* n. sp., in details of the pseudoclasper morphology, the higher dorsal and anal fin ray counts (82–88 versus 76–81 and 66–71 versus 62–65 respectively), the very narrow scale patch on the cheek (2 versus 5–7 rows) and the sharp snout (versus stubby).

This species is easily distinguished from the various co-occurring species of the genus *Diancistrus*, such as *D. alleni, D. beateae, D. brevirostris, D. megrouthcri, D. novaeguineae* and *D. tongaensis*, by the lack of 2 lower preopercular pores (see definition of the genus) and the very narrow scale patch on the cheek with only 2 scale rows.

Distribution (Fig. 70). *Paradiancistrus acutirostris* is only known from two specimens from Vanuatu, Epi and Maewo.

Etymology. The name refers to the sharp, pointed snout, *acutus* (Latin) = acute and *rostrum* (Latin) = bow of a ship, nose.

***Paradiancistrus cuyoensis* n. sp.**

(Figs 70, 73, 74; Table 33)

Material examined. (2 specimens, 36–57 mm SL). Holotype – USNM 263688, male, 36 mm SL, 10°53'N, 121°11'E, Cocoro Island west side, Cuyo Islands, NE of Palawan, Philippines, 0–21 m, Smithsonian team, Silliman group, BFAR, 26 May 1978. Paratype – USNM 365840, 1 female, 57 mm SL, 09°29'N, 123°55'E, Pamilican Island south of Bohol Island, Philippines, 0–33 m, V.G. Springer *et al.*, 12 June 1978.

Diagnosis. Vertebrae 11+31–32=42–43, dorsal fin rays 76–81, anal fin rays 62–65; eyes large (2.4–2.5% SL); lower preopercular pores 1; outer pseudoclasper narrow wing-shaped, moderately long; inner pseudoclasper a long thin flap, anteriorly joined to outer pseudoclasper forming a u-shaped structure, with supporter; moderately broad scale patch on cheek with 5–7 scale rows on upper cheek, no scales on operculum; head profile with stubby snout.

Table 33. Meristic and morphometric characters of *Paradiancistrus cuyoensis* n. sp.

	USNM 263688 Holotype	USNM 365840 Paratype
Standard length in mm	37 male	57 female
Meristic characters		
Dorsal fin rays	81	76
Anal fin rays	65	62
Pectoral fin rays	18	19
Precaudal vertebrae	11	11
Caudal vertebrae	32	31
Total vertebrae	43	42
Rakers on anterior gill arch	16	17
Pseudobranchial filaments	2	2
D/V	7	6
D/A	20	18
V/A	14	13
Morphometric characters in % of SL		
Head length	27.0	28.9
Head width	13.8	17.4
Head height	20.3	25.8
Upper jaw length	14.3	15.3
Maxillary height	4.6	5.1
Diameter of pigmented eye	2.4	2.5
Interorbital width	5.1	7.0
Postorbital length	20.0	20.9
Preanal length	50.8	52.1
Predorsal length	35.1	36.5
Body depth at origin of anal fin	19.2	21.1
Pectoral fin length	-	-
Pelvic fin length	21.4	-
Base pelvic fin - anal fin origin	30.4	30.4

Description. The principal meristic and morphometric characters are shown in Table 33. Body with massive head and stubby snout; fishes mature at about 35 mm SL. Head with moderately broad scale patch on cheek (5–7 scale rows on upper); no scales on operculum. Horizontal diameter of body scales 2.0% SL. Body covered with small scales. Maxillary ending far behind eyes, dorsal margin covered by dermal lobe of upper lip, expanded posteriorly, with angle at ventral rear corner. Anterior nostril placed low on snout, close to the upper lip, less than 1/5 distance from tip of snout to anterior margin of eye. Posterior nostril small, about the size of anterior nostril and less than 1/6 the size of eye. Tip of opercular spine free, pointed. Anterior gill arch with 16–17 rakers, thereof 3 elongated rakers in an uninterrupted row at the angle. Pseudobranchial filaments 2. Dorsal fin originates at about 1/3 body length, predorsal 35–37% SL; anal fin origin at about mid-body, preanal 50–52% SL; distance pelvic fin base to anal fin base >30% SL. Caudal fin free, rounded.

Head sensory pores (Fig. 74 A-B). Supraorbital pores 3; 1st anterior associated by two pairs of cirri on either side. Additional small pore below eye. Infraorbital pores 6 (3 anterior and 3 posterior). Mandibular pores 6 (3 anterior and 3 posterior); 1st anterior associated with long single cirrus in front, 2nd large, about the size of anterior infraorbital pores. Preopercular pores 2 (1 lower and 1 upper), both tubular.

Dentition (of holotype). Premaxilla with 4 rows of granular teeth and 1 tooth row anteriorly, up to 1/1 pupil diameter closest to symphysis. Up to 5 rows of granular teeth posteriorly. Vomer teeth in 2 rows, with the larger teeth posteriorly. Palatine teeth in 1 row, with teeth up to 1/3 pupil diameter. Dentary with 4 rows of granular teeth and 1 tooth row anteriorly. About 13 large teeth on inner row in total, up to 1/1 of pupil diameter.

Otolith (Fig. 74 F-H). Moderately elongate, length to height 2.0 (36 mm SL); otolith length to sulcus length 2.4–2.6; sulcus inclined at 5°. Anterior tip of otolith pointed, posterior tip more rounded. Broad postdorsal angle in otoliths of males, very weak in otoliths of females.

Axial skeleton (of holotype). Neural and haemal spines slender, except for neural spines of vertebrae 4–5 inclined and 6–7 depressed, shorter in length than spines of 2nd-5th vertebrae. Bases of neural spines 5–8 enlarged. Parapophyses present from vertebra 7 to 11, very wide. Pleural ribs on vertebrae 2–10, absent on last precaudal vertebra. Epipleural ribs indistinct. First anal fin pterygiophore elongated, reaching tip of last precaudal parapophysis in males, but not in females.

Male copulatory organ (Fig. 74 C-E). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper narrow wing-shaped, moderately long, with slender supporter and slightly hooked tip; inner pseudoclasper long thin flap, anteriorly joined to outer pseudoclasper forming curved structure, with thin supporter anteriorly. Isthmus between pseudoclaspers narrow. Penis moderately long, curved, with broad base and tip.

Coloration. Live colour not known. Uniformly medium brown when preserved.

Fig. 73. *Paradiancistrus cuyoensis* n. sp. Holotype. USNM 263688, male, 36 mm SL.

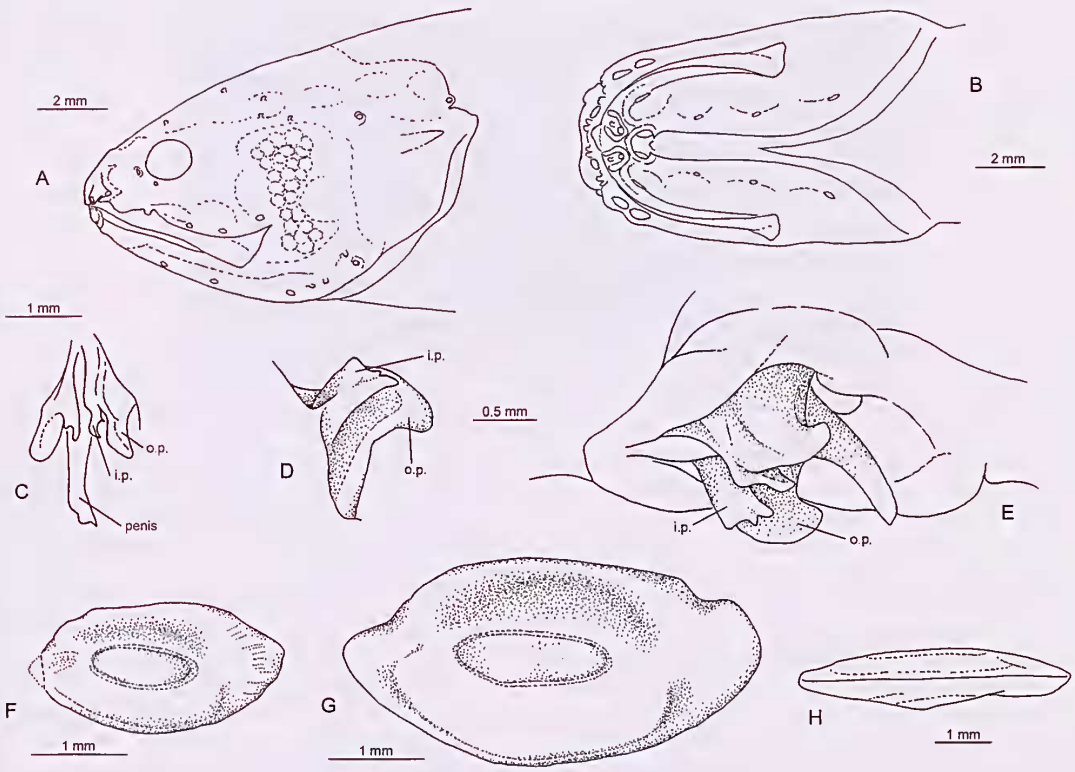

Fig. 74. *Paradiancistrus cuyoensis* n. sp. **A**, lateral view of head, holotype; **B**, ventral view of head, holotype; **C**, ventral view of male copulatory organ, holotype; **D**, view of left pseudoclasper from inside, holotype; **E**, inclined lateral view of male copulatory organ, holotype; **F**, median view of right otolith, holotype; **G**, median view of right otolith, USNM 365840, female, 57 mm SL; **H**, ventral view of right otolith, USNM 365840, female, 57 mm SL.

Comparison. See discussion of *P. acutirostris* under its account.

Distribution (Fig. 70). *Paradiancistrus cuyoensis* is only known from two specimens from the northern Philippines, NE Palawan (Cuyo) and Bohol Islands.

Etymology. Named after the type-locality – Cuyo Islands north-east of Palawan, Philippines.

GEOGRAPHIC DISTRIBUTION

The genus *Diancistrus* is the most speciose genus of the tribe Dinematichthyini and one of its most widely distributed genera. Its geographical distribution ranges from the Chagos and Maldives Islands in the west to the remote Ducie Atoll, Pitcairn Islands, in the east, which is the most eastward occurrence of the Dinematichthyini in the Indo-West Pacific. Dinematichthyine fishes so far have not been found at Hawaii, the Marquesas Islands or Easter Island, thus leaving a distribution gap across the eastern Pacific of about 4500 km from Pitcairn (Ducie) to the Galapagos Islands and nearly 7000 km from Canton Island, Phoenix Island Group (Kiribati) to the Pacific coast of Mexico.

The high number of species in the genus *Diancistrus* is explained by two main factors: 1) Many species have a restricted range of geographic distribution (endemic development) and, 2) the co-occurrence of several species in the same area, often representing different species groups (as previously defined). Areas of endemism are here defined as confined geographical provinces such as the Fiji or Tonga island groups or the north-west Australian shelf or the Great Barrier Reef south of 15°S and north of 15°, the latter including the adjacent part of Papua New Guinea.

Half of the total of 30 species of *Diancistrus, Brotulinella* and *Paradiancistrus* seem to be restricted to narrowly defined areas (Table 34). They are: *Diancistrus alatus* (Tonga), *D. fijiensis* (Fiji), *D. jackrandalli* (Ryukyu Islands), *D. jeffjohnsoni* (north-west Australian shores), *D. leisi* (Great Barrier Reef north of 15°S), *D. manciporus* (Tonga), *D. mennei* (Marshall Islands and perhaps Gilbert Islands), *D. niger* (Vogelkop Peninsula, Irian Jaya, New Guinea), *D. polupeiensis* (Pohnpei, Carolinas, Micronesia), *D. robustus* (Fiji), *D. vietnamensis* (northern Vietnam and Hainan), *Brotulinella taiwanensis* (Taiwan and Philippines north of 15°N), *Paradiancistrus acutirostris* (Vanuatu)

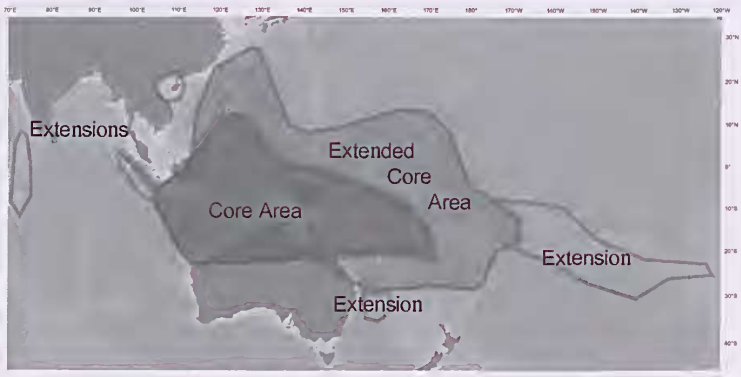

Fig. 75. Summary distribution map of the genera *Brotulinella* n. gen., *Diancistrus* and *Paradiancistrus* n. gen. The dark shaded core area contains 5–8 species, the medium grey extended core area 3–4 species and the light shaded extension areas mostly 1, rarely 2 species.

and *P. cuyoensis* (Palawan, Philippines south of 15°N, Sulu Sea); plus a few species occurring in just two areas: *Diancistrus mcgrouther*i (Great Barrier Reef north of 15°S to Madang in Papua New Guinea), *D. eremitus* (Hermit Island, Bismarck Archipelago to Solomons and Fiji) and *D. brevirostris* (Vanuatu and Loyalty Islands). Many of these species are so far known from only few specimens and might therefore be more widely distributed than known at present. Some species, however, are common in their restricted areas of occurrences and therefore are more likely to represent true narrow endemics. These are: *Diancistrus brevirostris, D. fijiensis, D. jeffjohnsoni, D. mcgrouther*i, *D. niger, D. vietnamensis* and *Brotulinella taiwanensis*. We explain this restricted distribution by the secretive and low mobility mode of living inside reefs, and their viviparous reproduction. The duration of larval stages in less secluded habitats might be very short, as suggested by the large size of newly born specimens.

Thirteen *Diancistrus* species exhibit a more widespread distribution pattern. Some species are typical for the area from the Philippines to the Ryukyu Islands – *Diancistrus erythraens* and *D. fuscus* – others for the central tropical West Pacific from the Sulu Sea to northern Australia comprising *D. altidorsalis, D. beateae, D. karinae, D. machidai, D. novaeguineae* and *D. springeri*. *Diancistrus longifilis* is widespread in the southern subtropical area from the Great Barrier Reef south of 15°S to the Loyalty Islands. A rather peculiar distribution pattern over large areas characterized by isolated oceanic islands is shown by *D. atollorum* (Palau, Carolinas and Hermit Island to the Marshall and Gilbert Islands) (Fig. 17). *D. katrineae* (along the south-easternmost reaches of the genus from the Cook Islands to the Tubuai and Society Islands to the Ducie Atoll) (Fig. 38) and *D. tongaensis* (Loyalty Islands, Vanuatu, Fiji, Tonga, Samoa and Society Islands) (Fig. 17).

The most widely distributed species of the genus is *D. alleni,* common throughout the tropical part of the West Pacific from the Java Sea to Samoa. Also it is the only species of the genus known from the Indian Ocean, the Chagos and Maldive Islands (Fig. 12). The occurrence of *D. alleni* in the Indian Ocean most likely is disjunct from its distribution further to the east. Extensive collecting from Ceylon and Thailand has not yielded any *Diancistrus* specimens and neither have the poorly sampled Andaman and Nicobar Islands.

It is not uncommon to find four or five species of the genus *Diancistrus* co-occurring in an area as described above. The maximum of six to eight species in a region is reached in the Banda Sea (including NW New Guinea), the Great Barrier Reef north of 15°S, Vanuatu, the Bismarck Archipelago and the Solomons. The Sulu, Celebes and Java Seas, which so far have yielded four or five species, are not very extensively sampled and are likely to be similarly rich in *Diancistrus* species.

A core area can be defined in the distribution pattern of the genus *Diancistrus* (Fig. 75) comprising the larger (eastern) part of Indonesia, the southern Philippines, New Guinea and the Bismarck Archipelago, northern Australia and the Solomon and Vanuatu Islands, all containing more than five sympatric species. Most species occurring in the core area are found more or less throughout, but there are also few seemingly restricted, endemic species such as *D. leisi, D. mcgrouther*i and *D. niger*.

Adjacent to the core area, an extended core area is recognized (Fig. 75) containing three to five sympatric species and comprising the northern Philippines, Taiwan and the Ryukyu Islands, the Carolinas, Marshall and Gilbert Islands, the southern part of the Great Barrier Reef, the Loyalty Islands, Fiji, Tonga and Samoa. This zone is rich in endemics, particularly so Ryukyu, Taiwan and the northern Philippines in the north and Fiji and Tonga in the south.

Further east, a major extension is noted (Fig. 75) along the Polynesian Islands from the Phoenix and Banks Islands to the Cook, Tubuai and Society Islands and beyond to Ducie Atoll in the Pitcairn group. It is mainly *D. katrineae* which is distributed along these widely spread and isolated islands and it could in fact be regarded as endemic since it does not occur further to the west. Finally, there are a few isolated disjunct occurrences just

Table 34. Geographic distribution panel of species of the genera *Brotulinella*, *Diancistrus* and *Paradianeistrus*. *Dianeistrus* species groups refer to: 1a = *Dianeistrus altidorsalis* subgroup, 1b = *Dianeistrus erythraeus* subgroup, 2a = *Dianeistrus longifilis* subgroup, 2b = *Dianeistrus springeri* subgroup, 3a = *Dianeistrus fijiensis* subgroup, 3b = *Diancistrus katrineae* subgroup.

		North Indian Ocean			Subtropical NW Pacific			Tropic W Pacific					Micronesia - Central W Pacific				Subtropical Tasman Sea			East W Pacific Island arches				East Polynesian Islands			
	Diancistrus species group	Chagos and Maldives	Ceylon and S India	Andamans, Thailand and Sumatra	N Vietnam and Hainan	Ryukyu Islands	Taiwan and Philippines N of 15°N	Sulu Sea and Philippines S of 15°N	Celebes Sea	Java Sea	Banda Sea and NW. New Guinea	NW Australia W of 142°E	Carolinas and Palau	Marshall and Gilbert islands	Bismarck Arch. and Solomons	GBR N of 15°S and SE PNG	GBR S of 15°S	Lord Howe Island	New Caledonia	Loyalty Islands	Vanuatu	Fiji	Tonga	Samoa	Cook and Society Islands	Tubua Islands	Pitcairn (incl. Ducie atoll)
D. altidorsalis	1a								x	x	x				x	x					x						
D. niger	1a										x																
D. atollorum	1b												x	x	x												
D. erythraeus	1b					x	x	x																			
D. mcgroutheri	1b														x	x											
D. robustus	1b																					x					
D. tongaensis	1b																			x	x	x	x	x	x		
D. sp. 3	1b			x																							
D. alleni	2a	x								x	x	x			x	x					x			x			
D. beateae	2a									x	x	x	x	x	x	x					x	x		x			
D. fuscus	2a					x	x	x																			
D. longifilis	2a																x	x	x	x							
D. maehidai	2a						x	x	x	x	x																
D. maneiporus	2a																						x				
D. novaeguineae	2a										x	x			x	x					x						
D. vietnamensis	2a				x																						
D. leisi	2b															x											
D. springeri	2b							x	x		x																
D. sp. 1	2					x																					
D. alatus	3a																						x				
D. brevirostris	3a																			x	x						
D. fijiensis	3a																					x					
D. jaekrandalli	3a					x																					
D. eremitus	3b														x							x					
D. karinae	3b							x	x				x	x	x												
D. jeffjohnsoni	3b											x															
D. mennei	3b													x													
D. pohnpeiensis	3b												x														
D. katrineae	3b																								x	x	x
D. sp. 2	3b																									x	
Paradiancistrus acutirostris																					x						
Paradianeistrus euyoensis								x																			
Brotulinella taiwanensis							x																				
Total number of species		1		1	1	4	4	5	4	4	7	4	4	4	8	6	1	1	1	3	7	5	3	3	2	2	1
Restricted (1 or 2 areas)		1		1	1	2	1	1	1		1	1	1	1	2	2				1	2	3	2			1	

outside the peripherals – in Vietnam with the endemic *D. vietnamensis*, at Lord Howe Island in the Tasman Sea (*D. longifilis*), also the southern-most occurrence of the genus and, as mentioned before, *D. alleni* at the Chagos and Maldive Islands. The latter is of particular interest because of its wide geographieal separation and yet there is no apparent specific morphological distinction of the specimens. We postulate that this pattern is the result of a recent geographic expansion that has become disjunet at the same time so that presumably separated populations have not yet developed into morphologically separable species.

Certain species groups (as defined by pseudoclaspers, see before) show a higher tendency towards endemism than others, for instance the *D. fijiensis,* the *D. katrineae* and the *D. erythraens* subgroups (Figs 17, 29, 38). We assume that the high degree of endemism in these subgroups is a result of an earlier pulse of geographie expansion during their evolution that then has subsequently led to allopatric speciation. The subgroup with the least amount of endemism, or the highest amount of widespread species, is the *D. longifilis* subgroup, to which *D. alleni* also belongs (Figs 12, 20). The only clear endemism in that subgroup is *D. vietnamensis*, which probably has originated from near *D. fuscus* (Fig. 55).

Finally, it is observed that endemic species or species with restricted distribution representing different species groups as defined by pseudoclaspers occur simultaneously throughout the core and the extended core areas. For instance in Fiji there are two species of the *D. erythraens* subgroup (one of them endemic), one (endemic) species of the *D. fijiensis* subgroup, one species of the *D. katrineae* subgroup and one species of the *D. longifilis* subgroup. At Hermit Island (north of New Guinea) the following subgroups and species have been found: *D. altidorsalis* subgroup (*D. altidorsalis*), *D. erythraens* subgroup (*D. atollorum*), *D. longifilis* subgroup (*D. alleni* and *D. beateae*) and *D. katrineae* subgroup (*D. eremitus* and *D. karinae*). A third example – at the Ryukyu Islands and Taiwan the following species represent the following subgroups: *D. erythraens* (*D. erythraens* subgroup), *D. fuscus* and *D. machidai* (*D. longifilis* subgroup), *D. jackrandalli* (*D. fijiensis* subgroup), *D.* sp. 1 (probably *D. katrineae* subgroup) and *Brotulinella taiwanensis.*

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